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"The respect which in all ages and countries has ever been paid to inventors seems, indeed, to rest on something more profound than mere gratitude for the benefits which they have been the means of conferring on mankind; and to imply, if it does not express, a consciousness that by the grand and original conceptions of their minds they approach somewhat more nearly than their fellows to the qualities and pre-eminence of a higher order of being."—*Muirhead.*

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TO THE SIXTY-NINTH VOLUME.

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Fig. 2.

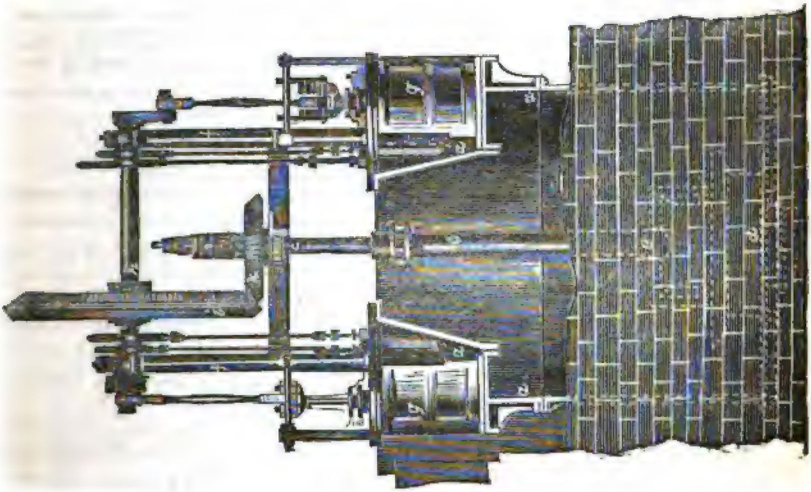
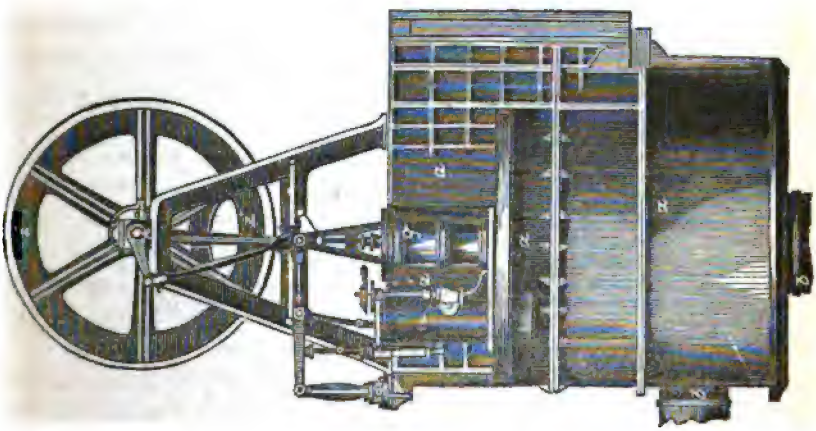


Fig. 1.



AMOS' STEAM MACHINERY FOR DRIVING ROTARY PUMPS.

Mr. C. E. Amos, Engineer, of the Grove, Southwark, has patented an invention which is designed to render the artificial foundation constructed for the setting up of rotary pumps available for carrying the weight of the engines employed for driving the same. The manner in which he prefers to effect this is to mount one or a pair of engines upon the sides of the vertical pump case, which may be recessed or otherwise shaped, to afford a good bearing to the cylinders; but where the pump is required to be sunk a considerable depth below the ground surface he proposes to mount the engines on the walls of the shaft in which the pump is sunk, instead of extending the metal casing up to the ground surface. The piston rods of these engines he connects to a horizontal crank shaft which carries a bevil wheel in gear with a pinion on the upright spindle of the pump, and the valves of these engines he drives (as usual) by eccentrics on the crank shaft.

In the engravings on the preceding page, Fig. 1 shows in side elevation, and Fig. 2 in front elevation (partly in section), so much of the arrangement of pumping machinery as will serve to explain the nature and mode of carrying out the invention. *a, a*, is a case or tank of cast iron set in brickwork, and communicating by pipes *b* with the water to be raised. In the centre of this case or tank is mounted a vertical shaft *c*, which carries at its lower end the centrifugal fan or wheel *d* for raising the water. This shaft has its bearings in a central tube *e*, and in a cross beam of the engine framing or standards, *f, f*, above. The tank *a* is recessed at its upper part, at *a'*, for the purpose of receiving and supporting the engines *g, g*, which are intended to drive the centrifugal pump. The pistons and slide valves of these engines are connected by the usual gear with a common crank shaft *h*, which has its bearings in the standards *f, f*. Upon this shaft *h* is mounted the bevil wheel *i*, which gears into the bevil wheel *k* on the shaft *c*, and thereby communicates to that shaft the rapid rotary motion required to keep the pump in efficient action.

By this invention, it will be understood, the patentee is enabled to save the expense of providing a separate foundation for the engines, which is a matter of considerable importance, and particularly when the pumping machinery is required to be erected, as is not unfrequently the case, on marshy ground.

SCIENCE AS A BRANCH OF EDUCATION.

BY PROFESSOR FARADAY, D.C.L., F.R.S.

[On the evening of Friday, June 11, we again had the pleasure of hearing Professor Faraday address the Royal Institution of Great Britain. His remarks on the occasion constituted the closing lecture of the season. The Duke of Northumberland, K.G., F.R.S., President, occupied the chair. The subject of the address was the Electric Telegraph in relation to Science, and the address consisted of an argument in favour of the full recognition of Science as a branch of education. The following is an abstract of the learned Professor's remarks, revised by himself:—]

The development of the applications of physical science in modern times has become so large and so essential to the well-being of man that it may justly be used as illustrating the true character of pure science, as a department of knowledge, and the claims it may have for consideration by Governments, Universities, and all bodies to whom is confided the fostering care and direction of learning. As a branch of learning, men are beginning to recognise the claim of science to its own particular place; for, though flowing in channels utterly different in their course and end to those of literature, it conduces not less, as a means of instruction, to the discipline of the mind; whilst it ministers, more or less, to the wants, comforts, and proper pleasure, both mental and bodily, of every individual of every class in life. Until of late years, the education for, and recognition of, it by the bodies which may be considered as giving the general course of all education, have been chiefly directed to it only as it could serve professional services,—namely, those which are remunerated by society; but now the fitness of university degrees in science is under consideration, and many are taking a high view of it, as distinguished from literature, and think that it may well be studied for its own sake, *i.e.* as a proper exercise of the human intel-

ligence, able to bring into action and development all the powers of the mind. As a branch of learning, it has (without reference to its applications) become as extensive and varied as literature; and it has this privilege, that it must ever go on increasing. Thus it becomes a duty to foster, direct, and honour it, as literature is so guided and recognised; and the duty is the more imperative, as we find by the unguided progress of science and the experience it supplies, that, of those men who devote themselves to studious education, there are as many whose minds are constitutionally disposed to the studies supplied by it, as there are of others more fitted by inclination and power to pursue literature.

The value of the public recognition of science as a leading branch of education may be estimated in a very considerable degree by observation of the results of the education which it has obtained incidentally from those who, pursuing it, have educated themselves. Though men may be specially fitted by the nature of their minds for the attainment and advance of literature, science, or the fine arts, all these men, and all others, require first to be educated in that which is known in these respective mental paths; and, when they go beyond this preliminary teaching, they require a self-education directed (at least in science) to the highest reasoning power of the mind. Any part of pure science may be selected to show how much this private self-teaching has done, and by that to aid the present movement in favour of the recognition generally of scientific education in an equal degree with that which is literary; but perhaps electricity, as being the portion which has been left most to its own development, and has produced as its results the most enduring marks on the face of the globe, may be referred to. In 1800, Volta discovered the voltaic pile; giving a source and form of electricity before unknown. It was not an accident, but resulted from his own mental self-education: it was, at first, a feeble instrument, giving feeble results; but by the united mental exertions of other men, who educated themselves through the force of thought and experiment, it has been raised up to such a degree of power as to give us light, and heat, and magnetic and chemical action, in states more exalted than those supplied by any other means.

In 1819, Oersted discovered the magnetism of the electric current, and its relation to the magnetic needle; and, as an immediate consequence, other men, as Arago and Davy, instructing themselves by the partial laws and action of the bodies concerned, magnetized iron by the current. The results were so feeble at first as to be scarcely visible; but, by the exertion of self-taught men since then, they have been exalted so highly as to give us magnets of a force unimaginable in former times.

In 1831, the induction of electrical currents one by another, and the evolution of electricity from magnets, was observed,—at first in results so small and feeble that it required one much instructed in the pursuit to perceive and lay hold of them; but these feeble results, taken into the minds of men already partially educated and ever proceeding onwards in their self-education, have been so developed as to supply sources of electricity independent of the voltaic battery or the electric machine, yet having the power of both combined in a manner and degree which they neither separate nor together could ever have given it, and applicable to all the practical electrical purposes of life.

To consider all the departments of electricity fully, would be to lose the argument for its fitness in subserving education in the vastness of its extent; and it will be better to confine the attention to one application, as the electric telegraph, and even to one small part of that application, in the present case. Thoughts of an electric telegraph came over the minds of those who had been instructed in the nature of electricity as soon as the conduction of that power with extreme swiftness through metals was known, and grew as the knowledge of that branch of science increased. The thought, as realized at the present day, includes a wonderful amount of study and development. As the end in view presented itself more and more distinctly, points at first apparently of no consequence to the knowledge of the science generally rose into an importance which obtained for them the most careful culture and examination, and the almost exclusive exercise of minds whose powers of judgment and reasoning had been raised first by general education, and who, in addition, had acquired the special kind of education which the science in its previous state could give. Numerous and important as the points are which have been already recognised, others are continually coming into sight as the great development proceeds, and with a rapidity such as to make us believe that, much as there is known to us, the unknown far exceeds it, and that, extensive as is the teaching of method, facts, and law, which can be established at present, an education looking for far greater results should be favoured and preserved.

The results already obtained are so large, as even in money value to be of very great importance;—as regards their higher influ-

ence upon the human mind, especially when that is considered in respect of cultivation, I trust they are, and ever will be, far greater. No intention exists here of comparing one telegraph with another, or of assigning their respective dates, merits, or special uses. Those of Mr. Wheatstone are selected for the visible illustration of a brief argument in favour of a large public recognition of scientific education, because he is a man both of science and practice, and was one of the very earliest in the field, and because certain large steps in the course of his telegraphic life will tell upon the general argument. Without referring to what he had done previously, it may be observed that in 1840 he took out patents for electric telegraphs which included, amongst other things, the use of the electricity from magnets at the communicator, —the dial face,—the step-by-step motion,— and the electro-magnet at the indicator. At the present time, 1858, he has taken out patents for instruments containing all these points; but these instruments are so altered and varied in character above the former, that an untaught person could not recognise them. The changes may be considered as the result of education upon the one mind which has been concerned with them, and are to me strong illustrations of the effects which general scientific education may be expected to produce.*

In the first instruments powerful magnets were used, and keepers with heavy coils associated with them. When magnetic electricity was first discovered, the signs were feeble, and the mind of the student was led to increase the results by increasing the force and size of the instruments. When the object was to obtain a current sufficient to give signals through long circuits, large apparatus were employed, but these involved the inconveniences of inertia and momentum; the keeper was not set in motion at once, nor instantly stopped; and, if connected directly with the reading indexes, these circumstances caused an occasional uncertainty of action. Prepared by its previous education, the mind could perceive the disadvantages of these influences, and could proceed to their removal; and now a small magnet is used to send sufficient currents through 12, 20, 50, a hundred, or several hundred miles; a keeper and helix is associated with it, which the hand can easily put in motion; and the currents are not sent out of the indicating instrument to tell their story until a key is depressed, and thus irregularity contingent upon first action is removed. A small magnet, ever ready for action and never wasting, can replace the voltaic battery; if powerful agencies be required, the electro-magnet can be employed without any change in principle or telegraphic practice; and, as magneto-electric currents have special advantages over voltaic currents, these are in every case retained. These advantages I consider as the results of scientific education, much of it not tutorial, but of self; but there is a special privilege about the science-branch of education, namely, that what is personal in the first instance immediately becomes an addition to the stock of scientific learning, and passes into the hands of the tutor, to be used by him in the education of others, and enable them in turn to educate themselves. How well may the young man entering upon his studies in electricity be taught by what is past to watch for the smallest signs of action, new or old; to nurse them up by any means until they have gained strength; then to study their laws, to eliminate the essential conditions from the non-essential, and at last to refine again, until the encumbering matter is as much as possible dismissed, and the power left in its highly developed and most exalted state.

The alterations or successions of currents produced by the movement of the keeper at the communicator pass along the wire to the indicator at a distance; there each one for itself confers a magnetic condition on a piece of soft iron, and renders it attractive or repulsive of small permanent magnets; and these, acting in turn on a propelment, cause the index to pass at will from one letter to another on the dial face. The first electro-magnets, *i.e.* those made by the circulation of an electric current round a piece of soft iron, were weak; they were quickly strengthened, and it was only when they were strong that their laws and actions could be successfully investigated. But now they were required small, yet potential. Then came the teaching of Ohm's law; and it was only by patient study under such teaching that Wheatstone was able so to refine the little electro-magnets at the indicator as that they should be small enough to consist with the fine work there employed, able to do their appointed work when excited in contrary directions by the brief currents flowing from the original common magnet, and unobjectionable in respect of any resistance they might offer to the transit of these tell-tale currents.

These small transitory electro-magnets attract and repel certain permanent magnetic needles, and the to-and-fro motion of the latter is communicated by a propelment to the index, being there converted into a

* The former and the present apparatus were set to work in illustration of the points as they were noticed.

step-by-step motion. Here everything is of the finest workmanship; the propelment itself requires to be watched by a lens, if its action is to be observed; the parts never leave hold of each other; the vibratory or rotatory rachet wheel and the fixed pallets are always touching, and thus allow of no detachment or loose shake; the holes of the axes are jewelled; the moving parts are most carefully balanced, a consequence of which is that agitation of the whole does not disturb the parts, and the telegraph works just as well when it is twisted about in the hands, or placed on board a ship or in a railway carriage, as when fixed immoveably. When it is possible, as in the vibratory needle, the moving parts are brought near to the centre of motion, that the inertia of the portion to be moved, or the momentum of that to be stopped, should be as small as possible, and thus great quickness of indication obtained. All this delicacy of arrangement and workmanship is introduced advisedly; for the inventor, whom I may call the student here, considers that refined and perfect workmanship is more exact in its action, more unchangeable by time and use, and more enduring in its existence, than that which, being heavier, must be coarser in its workmanship, less regular in its action, and less fitted for the application of force by fine electric currents.

Now there was no accident in the course of these developments;—if there were experiments, they were directed by the previously acquired knowledge;—every part of the investigations was made and guided by the instructed mind. The results being such (and like illustrations might be drawn from other men's telegraphs or from other departments of electrical science), then, if the term education may be understood in so large a sense as to include all that belongs to the improvement of the mind either by the acquisition of the knowledge of others or by increase of it through its own exertions, we learn by them what is the kind of education science offers to man. It teaches us to be *neglectful* of nothing;—not to despise the small beginnings, for they precede of necessity all great things in the knowledge of science, either pure or applied. It teaches a continual comparison of the *small and great*, and that under differences almost approaching the infinite: for the small as often contains the great in principle as the great does the small; and thus the mind becomes comprehensive. It teaches to deduce principles carefully, to hold them firmly, or to suspend the judgment:—to discover and obey *law*, and by it to be bold in applying to the greatest what we know of the smallest. It teaches us first by tutors and books to learn that which is already known to others, and then by the light and methods which belong to science to learn for ourselves and for others;—so making a fruitful return to man in the future for that which we have obtained from the men of the past. Bacon, in his instruction, tells us that the scientific student ought not to be as the ant, who gathers merely; nor as the spider, who spins from her own bowels; but rather as the bee, who both gathers and produces.

All this is true of the teaching afforded by any part of physical science. Electricity is often called wonderful, beautiful; but it is so only in common with the other forces of nature. The beauty of electricity, or of any other force, is not that the power is mysterious and unexpected, touching every sense at unawares in turn, but that it is under *law*, and that the taught intellect can even now govern it largely. The human mind is placed above, not beneath it; and it is in such a point of view that the mental education afforded by science is rendered supereminent in dignity, in practical application, and utility; for, by enabling the mind to apply the natural power through law, it conveys the gifts of God to man.

MR. W. FAIRBAIRN ON THE RESISTANCE OF TUBES TO COLLAPSE.

A paper on the above subject, by Mr. W. Fairbairn, C.E., F.R.S., &c., was read at the Royal Society on the 20th of May last.

The object kept in view by the author of these researches was to determine the law which governed the resistance of cylindrical tubes to external uniform pressure. The anomalous condition in which these constructions have been placed in reference to the internal flues of boilers, and the frequent fatal accidents from explosions produced by collapse, have imperatively called for inquiry into the causes which have led to these unfortunate results. Ever since the first introduction of the steam engine as improved by Watt, and especially since the increased demand for its construction, and its application to almost every branch of industry and every system of transit, the consideration of all circumstances which may affect its economy and security has become of vast public importance.

During the more early period which followed its first introduction, the form of boiler and its powers of resistance to strain were considerations of much less importance than at present. Then the force of steam, or the pressure under which it was

generated, was only about one-eighth, and in some cases less than a sixteenth of what it now is. Besides, the fertile genius of Watt had provided against accident by a self-acting apparatus, which regulated not only the pressure but the supply of water to the boiler. Since that time a total change has taken place in the construction and working of the steam engine; and boilers which were perfectly safe at 7 lbs. upon the square inch are absolutely inadequate for generating steam at 40 lbs. to 50 lbs. on the square inch. This being the case, it follows that every precaution becomes urgently necessary which may serve to increase the strength and equalize the resisting power of vessels containing an element of such potent influence, and yet so essential to the comforts and enjoyments of civilized life.

Entertaining these views, the author goes on to say, that hitherto it has been considered an axiom in boiler engineering, that a cylindrical tube, placed in the position of an internal flue, is equally strong in every part when subjected to uniform external pressure; the length not affecting the strength of a flue so placed. This rule is, however, only true when applied to tubes of infinitely great length, and it is very far from true when the length of the tube does not exceed certain limits, and when the ends are retained in form by being riveted to the boiler, and thus prevented from yielding to external pressure. These facts were fully demonstrated by the experiments related in the paper, which, for obvious reasons, were conducted under circumstances as nearly as possible analogous to those now in actual operation upon a larger scale. With this view, a large and powerful cylinder, 8 feet long and 2 feet in diameter, was prepared for the reception of the tubes; and, being acted upon by hydraulic pressure, collapse was produced, and the results recorded, as fully explained in the paper. It will suffice here to state the more important conclusions derived from the investigation, which fell under the following heads:—1st, the strength of tubes as affected by length; 2nd, the strength of tubes as affected by diameter; lastly, the strength of tubes as affected by thickness of metal.

1. On the first head, *the strength as affected by length*, the results are conclusive and interesting. Within the limits of from 1 foot 6 inches to about 10 feet in length, it is found that the strength of tubes similar in every other respect, and supported at the ends by rigid rings, varies inversely as the length, as may be seen from the following results obtained with 4-inch tubes.

Resistance of 4-inch tubes to collapse.

Diameter. Inches.	Thickness of Plates. Inches.	Length. Inches.	Collapsing Pressure. lbs. per square inch.
4	·043	19	137
4	·043	60	43
4	·043	40	65

The remarkable differences in the resisting pressure of the above similar tubes will be at once apparent, and it will be found by calculation that they follow the law of inverse proportion, the same as those of larger dimensions, the strengths diminishing as the lengths are increased.

The same law of resistance is maintained in 6-inch tubes, giving, for a tube 30 inches long, 55 lbs., and for one 59 inches long only 32 lbs. on the square inch, as the pressure of collapse. Again, in 8-inch tubes we have, in a long series of experiments, 32 lbs. per square inch in a tube 39 inches long, and 39 lbs. in one 30 inches long. In the same manner all the experiments on tubes of 10 and 12, and up to 18 inches, in diameter may be compared, and the law of resistance is in like manner shown to hold true in every case. Discrepancies to a certain extent do certainly occur; but they are comparatively small, and, as they appear to follow no law, are evidently to be accounted for from defects in the construction of the tubes inseparable from such a mode of research.

2. *The strength as affected by the diameter.* A precisely similar law is found to hold in relation to the diameter. Tubes similar in other respects vary in their resistance to collapse inversely as their diameters; and, with a view of testing this law, we may place the calculated pressure beside that derived from experiment, as under:—

Resistance of tubes to collapse 5 feet long.

Diameter. Inches.	By Experiment. lbs. per square inch.	By Calculation. lbs. per square inch.	Variation. lbs.
4	43·0		
6	32·0	28·6	—3·4
8	20·8	21·3	+0·7
10	16·0	17·2	+1·2
12	12·5	14·3	+1·8

The above variations are slight when compared with the resisting powers of the tubes; they are doubtless caused by the varying rigidity of the iron, or by defects in the cylindrical form. Similar results follow in the experiments on tubes 2 feet 6 inches long; and, although some slight variations occur, they are nevertheless not more than might have been anticipated within the ordinary limits of error.

3. *The strength of tubes as affected by thickness.*

In these experiments it is found that the tubes vary in strength according to a certain power in the thickness; the index of which, taken from the mean of the experiments, is 2·19, or rather higher than the square.

Combining the above laws into a general expression, we have, as the formula for the strength of tubes subjected to a uniform external force,

$$P = C \times \frac{k^{2\cdot19}}{P \times D},$$

where P is the collapsing pressure, k the thickness of the plates, L the length of the tube, which should not be less than 1·5, or greater than 10 feet; D the diameter, and C a constant to be determined by the experiments. For tubes of greater length than those above specified, a variable quantity, dependent upon the length, must be introduced; and the value of this has yet to be determined. For ordinary practical calculations the following formula will probably, however, afford the needful accuracy:—

$$P = 806{,}300 \times \frac{k^2}{L \times D}.$$

Thus, for example, take a tube or boiler flue 10 feet long, 2 feet diameter, and composed of plates $\frac{1}{4}$ inch thick; and the collapsing pressure will be

$$P = 806{,}300 \times \frac{\cdot25^2}{10 \times 24} = 210 \text{ lbs.}$$

per square inch, or nearly so.

Some experiments have also been made upon elliptical tubes; and the results have been most conclusive as to the weakness of such forms in resisting external pressure. No tubes in use for boilers should ever be made of that form.

With regard to cylindrical internal flues, the experiments indicate the necessity of an important modification of the ordinary mode of construction, in order to render them secure at the high-pressures to which they are now almost constantly subjected. If we take a boiler of the ordinary construction, 30 feet long, 7 feet in diameter, and with one or more flues 3 feet diameter, it will be found that the outer shell or envelope is from three to three and a half times as strong in resisting an internal force as the cylindrical flues which have to resist the same external force. This being the case, it is evident that the excess of strength in those parts of the vessel subjected to tension *is actually of no use* so long as the elements of weakness are present in the other parts subjected to compression.

To remedy these defects, it is proposed to rivet strong rings of angle iron at intervals along the flue—thus practically reducing its length, or in other words increasing its strength to a uniformity with that of the exterior shell. This alteration in the existing mode of construction is so simple, and yet so effective, that its adoption may be confidently recommended to the attention of all those interested in the construction of vessels so important to the success of our manufacturing system, and yet fraught with such potent elements of disaster when unscientifically constructed or improperly managed.

SUBMARINE TELEGRAPHS TO INDIA AND ELSEWHERE.

Whatever may be the fate of the Atlantic Cable, with which the greatest experiment of the age is now being performed, all doubt is dispelled respecting two facts: first, that for intercommunication between this sea-girt island and its colonies submarine are far preferable to overland cables; and, secondly, that for submarine cables of great length *light ropes* only should be employed. The first of these facts needs no remark, arising as it does from principles of economy, and from the manifest advantage of a kingdom like ours having no portion of its means of communication unnecessarily subject to the control of foreign powers. On the second point we desire to add a word or two.

During the last few months a great change has taken place in the opinions of professional men and of the public generally in reference to the desirability of using weighty and cumbrous cables for submarine telegraphic purposes. For short distances such cables are all that could be desired, as experience has shown; and, deciding with too little discrimination, our telegraphic engineers proceeded to apply similar cables for deep-sea purposes. It is true that the Atlantic Company, before undertaking their gigantic operations, so far suspected their applicability to these purposes as to devise and adopt a much lighter rope than was usual; but they still retained some of the worst features of the old ropes, although in a modified form.

Now for years past Mr. Allan has urged the adoption of the direct contrary of the heavy cables; and it is only due to ourselves to say, that we have uniformly supported him in his efforts. It is to his foresight that the public are indebted even for the first extensions of submarine telegraphy. When others rested satisfied with 25 miles of cable between Dover and Calais, and thought a 50-mile cable impossible, he showed the feasibility of a 70-mile cable to Belgium, and subsequently of a 120-mile length to Holland, for which, so far back as 1852, he procured the concession. In the very early stages of the system he clearly set forth the self-destructive character of the heavy cables, should attempts be made to submerge them in waters of great depth; and, to obviate the evil, in the spring of 1853 he took out a patent for a rope, the mechanical construction of which was the reverse of those in use, having as its main feature an inextensible core. Later in the same year he patented another, maintaining the same principles of construction, but of such an arrangement of parts as to produce a rope, not only light per mile, but of such low specific gravity that it might be laid with facility across the Atlantic, without risk of injuring itself by the tension resulting from its own weight. With these improvements, and others comprising the production of electricity in a manner suitable for the purpose, Mr. Allan enunciated, as was stated in the *Times*, Oct., 1853, the project of an Atlantic telegraph. He was suffered, however, to stand alone, and even from the scientific press received no other support than that afforded by ourselves.

In March, 1856, undaunted by previous discouragements, Mr. Allan addressed a letter to the Rt. Hon. H. Labouchere, Secretary of State for the Colonies, in which not only was the Atlantic telegraph proposition revived, but the idea of the Great Indian Submarine Telegraph Company, now about, we trust, to be carried out, was put forth in these words:—"It is feasible to lay lines from this country (say Plymouth) to Gibraltar and Malta, and so on up the Mediterranean, *en route* to India. Such a line would be conducive to British governmental and mercantile interests, and more independent under many circumstances than transmitting through the present foreign systems across Europe; and which, besides, would create a large tax or tollage on the cost of a message to India and Australia."

The present Atlantic Company was shortly afterwards started, and for a time monopolizes that particular field. In carrying out their plans, however, they have so far approximated towards Mr. Allan's electrical systems as to induce him to apply for an injunction to restrain them from infringing upon his patent rights, the application being now pending.

Before the telegraph squadron sailed last year with the Atlantic cable, Mr. Allan stood almost alone in predicting the failure which occurred, and the scientific grounds for his prediction were made public. These grounds were indeed clearly set forth by him in a letter addressed to ourselves so long ago as the 24th of December, 1855. After last year's failure, men grew suddenly enlightened; and, after the able papers of Captain Blakely at Dublin, and Messrs. Longridge and Brooks at the Institution of Civil Engineers, the merits of light ropes and the utter unfitness of heavy ropes for deep-sea purposes became universally acknowledged.

Our readers will not be surprised to find that we are indisposed to allow the man who has fought the battle and won this victory to have his name suppressed by the many advocates of light cables who are now springing up into public prominence, and adroitly seeking to carry off the spoils of war. Mr. Allan, and Mr. Allan alone, has the great merit of introducing the light-rope system, which will now become universal; and they who have helped, either early, as in our own case, or later, as in the case of some others, to aid him in the undertaking, are indebted to him for the first correct knowledge possessed upon the subject. No man ever gained a more complete or certain triumph in the field of practical science than he has achieved in this matter.

For the future, heavy cables will be used in shallow waters only. For all deep waters the light cable will be adopted; and we very much doubt whether any company whatever will be able to construct these properly without license from Mr. Allan, under his patents of 1853, which virtually give him the monopoly of what, up to the present time, are the only practical means known of mastering the difficulties attendant upon the construction, submergence, and working of ocean telegraphs.

We shall not enter into the rival schemes for telegraphs to India. The objections to the Red Sea Telegraph Company's plan and to the Euphrates Valley Line have been amply discussed in the newspapers, and are now pretty well understood by the public. It only remains for us to say that, while these are fragmentary and uncertain, the new company's plan—the Great Indian Submarine Telegraph Company's—is complete and reliable, both in construction and working. It is also essentially national, giving us direct communication with India independently of all foreign aid; and, as

the number of its stations will be necessarily few, its working cost, and therefore the cost of transmitting messages by it, will be 50 per cent. less than that of the competing lines.

THE SEWAGE QUESTION, AND ITS AGRICULTURAL BEARINGS.

As nearly everyone in London is aware, there are now two plans before the Sewage Commission for the disposal of the metropolitan refuse and excremental matter. The one leaving nothing to be desired on the score of convenience and of complete efficacy for the immediate purpose in view, and, apparently, with the only drawback of a heavy expense, is to the press and the public in general the *summum bonum* of sanitary measures—

"A consummation most devoutly to be wished."

The other, less comprehensive in its general arrangement, and liable to challenge in several weak points, halves the expenditure, halves the difficulty, and, perhaps, also, would extend to us but half the benefits of a complete regeneration of our river and contaminated atmosphere. In the former plan the sewage would be conducted to the Essex and Kentish coasts, there to be discharged into the sea; in the latter it would be collected in reservoirs where the solid matter would separate from the fluid, the one to be *deodorized* and discharged into the river Thames, the other to be "pumped away in the form of sludge and carried out to sea."

Without confining ourselves to a repetition of the substance of a very able article in last week's *Engineer*, insisting upon the expediency of utilising the manure constituents of sewage—not solely and separately as a commercial undertaking, but as some kind of set-off to the expense of a less objectionable system—we would draw further attention to considerations not less important than the sanitary object which, too exclusively, perhaps, engrosses public interest. That our "noble river," and others throughout England, should be sullied with all the foulness of towns, is to the chemist a melancholy spectacle in more points of view than would be taken by the ordinary observer. Nothing can be more true than the observation that dirt is but matter in the wrong place. The same substances which are pestilential or detrimental to animal existence are those which are greedily absorbed by growing vegetation, producing thereon a most beneficial effect, and thus exemplifying the axiom that everything is useful in its proper sphere. In the fluid constituents of sewage there is a fertilizer that is not easily supplied, an agent without which the fields whence we derive our food and that of our cattle would remain barren, either of the waving wheat or the fattening turnip. Of *nitrogen* there must always be a supply from the atmosphere; but for the next great agent of fertility we are now dependent upon our own prudence and foresight. The effects of "superphosphate" are known and appreciated; but it is, perhaps, only the chemist who can perceive that, as superphosphate is formed from the bones of animals nourished on the land, and as it is applied to wheat soils, there must be a constant and ultimately fatal waste unless the "liquid manure" be utilised, and the phosphates again find their way to the land. To afford these phosphates, the present supply of guano is inadequate; the future supply may be more so. And it must be understood, that, if the present system of waste, the economic crime and calamity of a wholesale and systematic rejection of organic and readily organizable matter, be continued, England will hold within herself an essential condition of future agricultural distress. Thus the question of continuously draining from the land enormous quantities of organic matter which are permanently lost by the discharge of sewage into the sea, or of employing this matter for agricultural purposes, must not be regarded as of individual or limited importance, but as a question of national interest. In the one case the nation would continue to possess the elements of continued prosperity; in the other, we again repeat, it would embrace one of the conditions of decay.

If it is painful to witness a system by which substances representing an annual *money* value of one and a half millions sterling are wasted and allowed to produce various ill effects; it would be assuredly not less so to view the expenditure of from five to ten millions in ensuring this waste while preventing these ill effects. A luxuriant vegetation is nature's great purifier and disinfectant, the agency she employs in renovating all that animal life has rendered effete or noxious to itself. There is in the animal and vegetable kingdoms a mutual dependence and reciprocity by which they suffice for each other's requirements, and minister to each other's benefit. Having observed this great law of reciprocity, we should act in accordance with it—we should at least be careful how we interfere with it by artificial measures, lest we exclude ourselves from its benefits.

But to turn to the second proposition of the Sewage Commission, which, however unfavourably it may be regarded, owes to its rational possibility a greater practical likelihood of adoption than is possessed by the former. It seems more than probable that

the solid matter collected in the reservoirs would ere long be used as manure. The deodorized fluid, however, which is to be discharged into the Thames, is a difficulty and an anomaly that we cannot pass over. This "deodorized fluid" would still be a highly active organic product, an impurity to river water in the fullest sense of the term. It must be mineralized as well as deodorized, before it can with any degree of reason be allowed to mingle with the *quasi*-purified stream. But the point we have to dwell upon is, that in this fluid would probably be contained the manure constituents of greatest value in the sewage.

One of the late Lord Yarborough's tenants, a Mr. Nelson, used to say that "he did not care who knew that he had made £80,000 by employing bones before other people knew the use of them." We heartily hope that a similar sum may be realized by those who may have the intelligence and enterprise to bestow their attention to the possible source of a large supply of agricultural fertilizers that we have pointed out. Any patent which may have been taken out for the separation of phosphoric acid and ammonia from liquid sewage should now have the fullest investigation, to discover whether it would be applicable to the above-mentioned product of a new system of drainage, and, if the processes which may hitherto have been tried are found to be inadequate, experiments should be instituted to determine the practical possibility of this problem. Our most enlightened agriculturalists cannot be blind to the necessity of some new source of phosphoric acid. The *coprolites* found by Henslow on the coast of Suffolk have probably long since been exhausted; and we hear no more of the *apatite* of Mr. Lawes. There are yet, perhaps, in England, such men as Coke, of Holkham, or the old Duke of Bedford, to whom aught affecting the agricultural greatness of England is of interest. And, if so, there are men who will not blindly join in the cry for efficient drainage; but whose object it will be to combine convenience and utility, health and prosperity, in a more perfect system. It is a proposition easily understood, that, as *phosphates* are necessary to the fertility of the soil which contains but a limited amount of them, and as they cannot, like *ammonia*, be replaced in any degree from the atmosphere, they must of necessity be returned to the land or wholly supplied from foreign and extraneous sources. A natural or an artificial system must be adopted to keep up the proportion in which the phosphates exist in a productive soil; but waste of no kind can be tolerated with safety in a country which nearly realizes the condition of the greatest amount of population on the smallest area of soil.

DESMOND G. FITZGERALD.

29th June, 1858.

SELF-MOVING MACHINERY.

GENTLEMEN,—If you think it a matter of importance—as I believe it is—to keep in view occasionally in the minds of the many who even now, I fear, are disposed to follow that will-o'-the-wisp perpetual motion, the true basis on which the fallacy rests, you will allow me to protest against that false foundation on which your correspondent Mr. J. A. Davies would build an argument against it. He says, that a force to raise its own weight is impossible, and thence infers that "friction being the primary cause of the failure is quite erroneous." Now, assuming that perpetual or self-sustaining motion or power means no more than the terms imply, and does not embrace the idea of absolute generation, friction most undoubtedly *is* "the primary cause of failure;" for, otherwise, the power that fails "continually to sustain itself," and "to supply [maintain] the amount originally given," would be the subject of annihilation, and as great a mystery as the correlative one of its creation.

Apart from what is practical, and looking only to the absolute relations of things, it is not in friction, nor even in the work proposed to be done, but in the want of perfect isolation, that the true cause of the impracticability of perpetual motion is to be sought. It should be clearly understood, that such self-sustaining activity is not an absurdity, nor even an impossibility, except to finite beings; and that not by reason of our being unendowed with power to create or alter at pleasure the properties of things, but because, although in possession of what perhaps is just possible, the degree of intelligence and skill to devise a system of continuously-recurring cycles of circulating agencies, which would not depend for existence on extraneous support, we should be unable so to shut them up in a little world of their own as to prevent them from wandering away into other spheres of action. Such a self-perpetuating and yet diminutive circle of things may be seen in partial exhibition in a vivarium, where animal and vegetable life support each other in a continual round. It is, I think, the nearest approach to perpetual motion which man, in dealing with the powers of nature—and they must always be more or less prepared to his hand—has hitherto contrived; and yet without the intelligence to perceive more than a very few links in the endless chain. It is not, however, entirely without extraneous support; and hence, however

exact the balance at first established in the system, it must perish ultimately through accumulation and excess, and the destructive agencies thus evoked. The nearest approach, however, in reference to perfect isolation, and wholly free from external aid, but without embracing a circle of actions, is the suggestion I have heard of a top spinning in an exhausted receiver, and suspended by means of a magnet.

But of what avail would be the existence even of microcosms that embraced an extensive and multifarious sphere of operations, seeing that by the very conditions of the problem—isolation and self-support—and just in proportion as they the more perfectly fulfilled those conditions, they would exist for themselves alone, and so, affording no spare products, would be useless to man.? To participate in any benefit, he must himself become a component part of such a system; and for that nothing less than a world and a universe will suffice.

BENJ. CHEVERTON.

RESULTS OF THE SCIENCE AND ART DEPARTMENT FOR 1857.

It has been shown that the desire of the public to use the facilities offered by the State for the study of science and art is greatly on the increase.

The various metropolitan Museums and exhibitions in London, Dublin, and Edinburgh have been visited by 553,853 persons, being an increase of as many as 186,915 persons on 1856. The visitors to the Botanical and Zoological Gardens in Dublin have been 168,098, showing an increase of 10,222 persons on 1856. The circulating art-museum has been sent to Stourbridge, Worcester, Liverpool, Glasgow, Paisley, and Dundee, and 36,024 persons have consulted it. The various schools of science and courses of public scientific lectures have been attended by 10,372 students. The total number of students connected with the schools of art, or under inspection, has been 43,212, being an increase of 25 per cent. on the numbers returned in June, 1856; whilst the cost of the State assistance, from being an average of 3*l.* 2*s.* 4*d.* per student in 1851, before the reform of the schools of design, has been reduced to an average of 13*s.* 1¾*d.* per student, the instruction at the same time having greatly improved, and the means for study largely increased.

The success of the removal of the science and art department from Marlborough-house to South Kensington has been so signal as to require some special notice of it.

The number of students in the Art Training School at Marlborough-house during the session ending February, 1856, was 292. The number in the month of last March at South Kensington was 407.

The visitors to the Museum in less than ten months have amounted to 439,997 persons, being nearly five times the average numbers annually that attended Marlborough-house. [The numbers for twelve months have been 488,361.] The experiment of opening the Museum in the evening has shown that that is the time most convenient to the working classes to attend public museums. Comparing time with time, the numbers have been five times as great in the evening as in the morning. The provision of somewhat increased space has enabled the department to be useful to all the local schools of art, in the circulation and lending of the articles in the Museum, and the books and prints in the library. These are no longer metropolitan institutions, but are essentially national in their influence. The South Kensington Museum is the storehouse of the United Kingdom, and every school of art is privileged to borrow from it any article that is safely portable.—[*From the Lord President's Annual Report.*]

SOCIETY OF ARTS' EXAMINATIONS.

THE Council of the Society of Arts have published their lists of the prizes and certificates awarded to the students examined by their local boards of examiners throughout the country. The results exhibited are in a very high degree gratifying. A "Working Engineer," George William Wicker, aged eighteen (an apprentice, we believe, in the Steam Factory at Portsmouth Dockyard), appears to have achieved the greatest success, having carried off three first prizes of £5 each, for arithmetic, algebra, and mensuration. Besides these prizes awarded to himself, he has secured for the Watt Institute at Portsea, of which he is a student, a special prize of £10, in addition to one of two first prizes of £15 each; the other of which has been awarded to the Crosby Hall Evening Classes, the pupils of which have very honourably distinguished themselves. The same young man also obtained certificates of merit in several other subjects, including statics, dynamics, hydrostatics, practical mechanics, geometry, and trigonometry, proving that his mathematical abilities, as a whole, have been exceedingly well cultivated. We should have been most happy to see him down for a certificate in descriptive geometry, a subject which would be of much practical value to him in his profession.

The name of Alfred Pickard, a youth of sixteen, belonging to the Young Men's

Christian Institute, Leeds, occupies a very honourable place. He obtained a second prize of £4 for algebra, and certificates of ability in arithmetic, geometry, trigonometry, conic sections, and astronomy. His Institute received a prize of £10.

John Charles Froyen, a shipwright belonging to the Mechanics' Institute, Pembroke Dock, although he received no prize, takes an extremely creditable place, having obtained certificates in arithmetic, algebra, mensuration, trigonometry, conic sections, statics, dynamics, hydrostatics, and astronomy. This candidate is, we believe, an illustration of the excellence of the instruction imparted in Her Majesty's Dockyard Schools.

We cannot, however, afford space to particularize very many young men, who—with young women, too, we are happy to say—have distinguished themselves at these examinations. Our readers must refer to the Journal of the Society for the 18th ult., for the complete lists.

The Local Boards at Crosby Hall Evening Classes and the London Mechanics' Institution have obtained special prizes of £10 and £4 respectively. The Banbury Mechanics' Institution and Sheffield People's College, have each received £10; and the Bristol Athenæum, the Leeds Mechanics' Institution, and the Lymington Literary Institution, each £5.

It should be observed, that no prizes were awarded in trigonometry, navigation and nautical astronomy, statics, dynamics, hydrostatics, practical mechanics, magnetism, electricity and heat, astronomy, animal physiology, French, German, freehand drawing, and mechanical or geometrical drawing, as no candidate obtained a first-class certificate in any of these subjects. The examinations are, however, novel as yet. We have no doubt that, when time has been given, the Society will not find it necessary to reserve any portion of their Prize Fund on the ground of the incompetency of the candidates.

To these remarks we may fitly add the following from the *Athenæum*:—"It is remarkable that three first prizes—arithmetic, algebra, and mensuration—should be carried off by 'a Working Engineer.' The prize in Chemistry is taken by 'a Worker in a Chemical Laboratory;' and the same candidate, although completely self-educated, gains the first prize in Botany. The best of the candidates, the person who gets the three first prizes, has not been at school for the last four years. The two first prizes in Descriptive and Physical Geography are awarded to a draper. The first prize in English Literature, in which the Head-Master of Rugby examined, is taken by a bank cashier; the second by a timber merchant, and the third by a grocer. But the prizes in Latin are, perhaps, the most astonishing of all: the first prize and first certificate being carried off by a butcher! This classical butcher does not, however, stand alone. Another butcher offered himself for examination in English and French Literature, and selected Shakspeare, Spenser, Racine, and Molière as the authors in which he desired to be tested. Professor Creasy, the examiner in English History, gives his first prize to a book-keeper, and awards certificates to a printer, a cabinet-maker, a mason, a porter, a spinner, a wool-carder, &c. The answering in English literature, in algebra, and in book-keeping was so remarkably good, that the Council awarded additional prizes in each of these subjects."

RAILWAY ACCIDENTS IN FRANCE AND ENGLAND.

From an interesting article which recently appeared in the Paris *La Patrie*, setting forth many important facts respecting accidents on the French railways,—which are, of course, more immediately under the control of the State than the English,—we learn that a Commission has presented to the Emperor a volume entitled "*Enquête sur les moyens d'assurer la régularité et la sûreté de l'exploitation sur les chemins de fer*," containing the results of examinations of officials from the railways du Nord, de l'Est, de Paris à Lyon, de Saint Germain, de Paris à Rouen, au Havre et à Dieppe, de l'Ouest, du Grand Central, and de Sceaux et d'Orléans. The volume is but preliminary, and is to be followed by others giving still more extensive results. The following facts are derived from it:—

Between the 7th September, 1835, and the 31st December, 1856, the number of railway passengers in France was 224,345,769. Of this number 1,979 were injured, and 999 killed—in all, 2,978. It is worthy of remark that of these accidents 1,134 only—334 killed and 800 wounded—arose from defects in the working of the railways; while 1,844—665 killed and 1,179 wounded—resulted from individual imprudences which were not attributable in any degree to the railway companies. Taking away the agents and servants of the companies, the number of passengers killed by the working of the trains is but 111, that is 1 in 2,021,133; and of passengers wounded, 402—1 in 558,074.

These facts speak much in favour of the working of railways in France, and present new inducements for us in this country to give the railway system at home more serious attention than has yet been be-

stowed upon it. We mention this, because it is becoming more and more apparent to us that the mitigation and prevention of accidents upon railways are left too exclusively in the hands of railway companies, and require a new form of public opinion to be brought to bear upon them. It is true that this subject is frequently brought before our professional institutions, such as the Institution of Civil Engineers, the Institution of Mechanical Engineers, &c.; but many of the members of these institutions have so direct an interest in the preservation of the existing railway systems, or in the furtherance of special schemes of improvement, that the matter does not, we think, there meet with the full and unprejudiced discussion which it deserves. For this reason we think it desirable that some more independent society, such as the Society of Arts for example, should give its attention to it; and, although it might fail to deal fully with all the technical points of difference which might arise, it could certainly collect such facts and opinions as would speedily bear fruit in increased safety of railway transit.

THE ATLANTIC CABLE.

Gentlemen,—When a misfortune happens to either an individual or a nation, there are always to be found some persons of superior sagacity to the rest of their kind, who immediately exclaim, "Just as I expected!" It is slightly damaging to the reputation of this class of would-be prophets that their expectations are expressed *after* rather than before the event.

Will you permit me, through your columns, to forestall these Job's comforters, and caution an enthusiastic public against forming too sanguine an expectation of success in the present attempt to lay down the Atlantic telegraph cable? I have given some study to the matter, and venture therefore to predict (BEFORE the arrival of the squadron at Valentia) that the expedition will be a failure, and that, though the greater part of the cable may, unfortunately, be laid, the communication between the two countries will not be accomplished.

Firstly, because "the paying-out apparatus" is defective in its principle, which is, that the rapidity of the revolution of the wheels is hindered or regulated by friction on their circumference; the cable passing round these wheels is, of course, regulated in its speed by them.

Now it is evident, on this plan, however modified, that, as the rapidity increases, the friction increases likewise. So that, supposing the normal rate of revolution to be 2 per second, with the supposed full power of the break, and the strain 36 cwt., and a lurch of the vessel to require a revolution of 4 or 6, then the increased rapidity of revolution will increase the friction, and there will be as a consequence a greater strain upon the cable than 36 cwt. (which is the highest the cable will bear throughout). It follows, therefore, necessarily, that the cable will at times be subject to a strain greater than it will bear, and will in all human probability be broken.

It is said, But the engineer in charge can release the wheels at the time of the lurch and increased strain. True, but the strain is on it before he knows it or can alter it. It is thus put in the power of one man, as before, by a moment's carelessness or inattention to blast the success of this enormous and expensive undertaking.

Further: suppose the cable does *break*, are there any provisions made for preventing "the loss of the end?" As far as I can learn, from carefully reading the published accounts of the experimental trip, *not one*. Some for permitting the deliberate *cutting* the cable in case of storm, some for underrunning afterwards; but, for that most probable of accidents as regards occurrence, that most uncertain as regards time, *the sudden and violent breaking of the cable*, I repeat, as far I know, there is no provision made; and this in spite of last year's lesson of its necessity! That the expedition should fail should astonish none: should it succeed (as I hope it may), it must be considered little short of the miraculous.

A. T. C.

June 28, 1858.

WOOLWICH IRRESPONSIBLE REPORTS.

Gentlemen,—Although I am not known to Capt. Norton, I cannot but regret that the Ordnance Select Committee should advise the Secretary at War not to allow this old and experienced officer's "concussion fuze," noticed by you in No. 1820, an impartial trial.

I am not willing to join with those who consider Major-General Peel not of sufficient influence to preside over a committee of senior officers; for my experience of discipline tells me, that, however inferior in military rank the Secretary at War may be, he must be respected and obeyed by those over whom it is the interest of the State to appoint him; and I am more inclined to attribute the *irresponsible* report of the Committee to the defective and mistaken notions of gunnery under which the *majority* of Ordnance reports are recorded.

The system which admits of injudicious reports at one time—such, for instance, as that under which Lord Panmure acted

when he gave £10,000 for the right of using an American patented invention, and then to order about double that amount for six guns to be made in New York on this invention, which turns out to be worse than useless in the opinion of professional men—and, at another, refuses to give a report to sanction the trial of comparatively inexpensive plans effecting the improvement of some hundred thousand pounds of public property, is seriously and ruinously wrong; and this has been long seen and felt throughout the service.

General Peel is no stranger to this; and he is, no doubt, aware that even Royalty has been *compelled* to submit as a passive agent of irresponsibility, in turn with those of less influence, selected to preside at the Admiralty and Ordnance branches of the Government. And it is to be hoped the Royal Commissioners appointed to investigate the defective workings of the Woolwich Establishment will shortly relieve him from his painful endurance of a system which calls so loudly for reform.

Royal Commissions but seldom produce good, although attended with incalculable expenses to the country; and the prevailing opinion is, those Ordnance and Naval Commissions suggested by Lord Derby will prove like those so subtlely organized by the Whig Government, got up and intended to shield from public indignation a system of irresponsibility which is not only convenient but profitable to the supporters of *party* administration.

Your reproof, Gentlemen, in page 614, is considered perfectly justifiable; but let us hope that Major-General Peel requires it not to prompt the necessary regeneration of irresponsible reports, so injurious to the public service.

Let us hope those who appointed him to the office not only know how, but feel determined to rid the service of a system which produces reports so destructive to scientific progress as that which dictated the letter in No. 1820; seeing, as they must, how commanding military improvements are made by passing events, such as disturb the repose of every quarter of the world at the present unsettled period.

June 28. OBSERVER.

CAPTAIN NORTON'S GOSSAMER CARTRIDGES.—Captain Norton is distributing his gossamer cartridges, together with copies of *The Family Herald* of last Saturday, describing the fabrication and manner of using them, to the troops now embarking at Gravesend for India. The authorities at the War Office *intend* to have these cartridges tested by "the Committee on Small Arms *when* it is practicable!"

RIFLES, AND HOW TO USE THEM.

GENTLEMEN,—I confess that some months ago I had fears for the safety of the British Isles; I now entertain no such apprehensions, because I know that the "Rifleman's Manual," by Mr. Busk, is on its "circling march" throughout the length and breadth of the land.

I am, Gentlemen, yours, &c.,
J. NORTON.

Rosherville, 28th June.

DRYING WOOD.

GENTLEMEN,—I shall feel obliged if some of your readers will inform me the best and quickest method of thoroughly drying pieces of oak blocks, say 12 in. by 3 in. by 3.

Yours, &c.,
A SUBSCRIBER.

June 26, 1858.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

HAMILTON, T. and J. *Improvements in turning, cutting, shaping, or reducing wood and other substances.* Dated Oct. 22, 1857. (No. 2695.)

This cannot be described without engravings.

MILNE, J. *Certain improvements in carding engines.* Dated Oct. 22, 1857. (No. 2696.)

This consists in the use of extra rollers covered with cards, and placed beneath the ordinary taker-in roller of the carding engine, the points of the card on the extra roller projecting towards or against those of the taker-in. The taker-in roller revolves at a higher speed than the extra roller, and thus delivers the cotton on to the main cylinder; and the extra cylinder revolving slowly causes the cotton to be carded and cleared from dirt, which would otherwise be taken on to the main cylinder; by this means also the fibre is worked much finer, and less waste is caused than heretofore.

CARDWELL, T. *Improvements in machinery for compressing cotton and other articles.* Dated Oct. 22, 1857. (No. 2697.)

This consists in combining a press, consisting of an arrangement of levers, with a donkey engine. The engine is mounted on the frame of the press, so that, where a number of cotton presses are employed, each press is worked by a separate engine, instead of being worked by shafting driven by one large engine as heretofore.

SMITH, J. *Improvements in horsehair crinoline for petticoats.* Dated Oct. 22, 1857. (No. 2699.)

This consists in manufacturing crinoline by the substitution of a linen for a cotton warp, the latter having hitherto been used.

HARRILD, R. and H. *An improvement in the manufacture of the composition used for printers' rollers.* Dated Oct. 23, 1857. (No. 2703.)

This consists in subjecting the glue to the action of high-pressure steam in a closed jacketed pan until it becomes converted into a jelly. The molasses is then mixed with it in the usual manner.

AKERMAN, W. H. H. *Improvements in organs and similar musical instruments.* Dated Oct. 23, 1857. (No. 2704.)

This relates to the construction of the air chambers in organs; that is, the chamber between the palates or palate bed and the vibrators or mouths of the pipes or stops. The patentee proposes to make it in the form of a rectangular wedge, having

its base sloping from the back to the front, where the palate is fixed, so that the sectional area at any distance from the front shall diminish in proportion to that distance from the free end of the palate, so that, by diminishing the capacity, an increase may be given to the elastic force of the air to compensate for the diminished impellent force acting upon it as it recedes from the palate. The next part relates to the construction of vibrators to be applied to organ stops or tubes, and to the embouchure of tube instruments of any kind operated upon by wind. He proposes to construct his vibrators nearly resembling in form and action the human lips.

Newton, A. V. *An improvement in the process of making wrought-iron beams or girders.* (A communication.) Dated Oct. 24, 1857. (No. 2706.)

This consists in forming the pile (in forming wrought-iron beams or girders) of two flat pieces or bars of about double the width of the upper and lower flanges respectively.

Macintosh, J. *Improvements in the construction and laying of telegraphic cables.* Dated Oct. 24, 1857. (No. 2707.)

For constructing telegraphic cables, the patentee first coats the conducting wire or strand with gutta percha or other insulating material, and then folds round it the bat or fleece from a carding engine, or in other ways surrounds the coated wire or strand with fibres laid parallel to its length, and by means of rollers or otherwise he crushes the fibres into the coating of insulating material while it is still soft. Afterwards he again coats with gutta percha or other substance, with which he mixes a quantity of iron filings. The salt water corrodes the iron filings (after submergence) into a solid mass. In laying telegraphic cables, he passes the cable, when it is clear of the ship, over a pulley suspended from the gaff by long springs of vulcanised india rubber, and the end of the gaff he stays to the topmast by a similar spring, so that the pulley is able, by the yielding of the springs, to rise and fall, and compensate for the upward and downward motion of the stern of the ship.

Thom, J., and H. McNaught. *Improvements in looms for weaving.* Dated Oct. 24, 1857. (No. 2708.)

This relates to an arrangement of mechanism for shifting the drop box of power looms working with two or more shuttles, and which may also be made to act on the heddle actuating details, so as to produce varied weaving effects.

Fairclough, J. and J., and J. Cowan. *Improvements for suspending and working window hangings and other drapery curtains.* Dated Oct. 26, 1857. (No. 2711.)

This consists in the use of a series of cross-levers, (lazy tongs), mounted on laths, tubes, or poles, and, in most cases, working through a longitudinal slot in the lath or other support. These cross-levers may be worked by cords and pulleys. The curtains or draperies are suspended to the cross-levers, so, by the expanding and contracting action of the levers, they are drawn backwards and forwards.

Clippele, C. de. *Improvements in the manufacture of boots and shoes, harness and driving straps, which improvements are applicable to uniting various materials together, and also for waterproofing.* Dated Oct 26, 1857. (No. 2713.)

This consists in producing a composition suitable, 1. For uniting materials, such as a bullet to its wooden cartridge, leather to leather, or cloth to cloth; for boots and shoes, pipes, harness, driving straps, &c. 2. For waterproofing roofs, cords, cables, &c., &c. Also, for forming a paste susceptible, when heated, of being moulded into rollers and fancy articles.

Fearabee, J., and C. Whitmore. *Improvements applicable to machinery for carding, scribbling, and condensing wool and other fibrous substances.* Dated Oct. 26, 1857. (No. 2716.)

This relates, 1. To a mode of stripping the doffers of scribbling and carding engines, and of laying and depositing the fleece on a travelling feed-cloth, by dispensing with the ordinary doffing comb, and employing in place thereof a roller, which delivers the fabrics in the form of a sheet to a pair of rollers, which will conduct the sheet to a carrying roller, whereby it will be deposited in a trough formed by an inclined board and a rotating roller. As the fleece is fed on to the inclined board at greater speed than it would be taken up in its natural state by the next pair of rollers, it becomes crowded up on it, and, consequently, is taken by the next pair of rollers doubled up in short folds, and is conducted to another machine also provided with an inclined board or trough. An endless belt forms the bottom of the trough, on to which the fleece falls in folds. By the rotation of the trough roller, which revolves at much greater speed than the travelling endless cloth moves, the fleece is drawn forward, and is crowded up in folds, so as to form a kind of bat on the travelling end cloth, which is made to move slowly onwards, and convey it either in a direct line or at an angle to the next machine. 2. To a mode of forming a bat, and consists in delivering from a scribbling or carding engine a fleece in folds on to an endless belt or roller travelling at any convenient angle thereto. As this belt forms the feed-cloth of another scribbling or carding engine, the fibres will be crossed and not drawn out longitudinally, and, therefore, the patentees produce yarns that will felt better and produce better cloth than ordinary. 3. To a mode of forming slivers or ribbons direct from the doffer cylinder of a carder or scribbler, and consists in dividing the fleece into ribbons or slivers by means of revolving narrow discs or surfaces.

Clarke, W. *Improved means of connecting and working brakes for railway carriages.* Dated Oct. 27, 1857. (No. 2718.)

This consists in connecting the brake apparatus of contiguous carriages by cords or chains. By passing these cords round pulleys, and attaching one end to an adjustable rod, the distance between the carriages may vary constantly without affecting the working of the brakes. The brake blocks are attached to the ends of horizontal bars jointed to vibrating levers, whereby they are worked.

Newall, J. *Improvements in railway brakes and signals, and in the machinery or apparatus for working the same.* Dated Oct. 27, 1857. (No. 2721.)

This cannot be described without engravings.

Daniell, H. J. *Improvements in communicating by signals between the pilot and steersman, and between other parts of vessels by means of dial apparatuses.* Dated Oct. 28, 1857. (No. 2726.)

The object is to afford means of communication between the look-out or pilot at the bow of a ship and the steersman at the helm; or between the master or pilot from the bridge of paddle-wheel steamers and the steersman, or, by a modified arrangement, with the engineer at the engine-room. The invention provides for working upright shafts furnished with indices working on or over dial-plates marked "port," "starboard," &c.

Addison, J. *Discovering and destroying hydrogen or carburetted hydrogen gas and other gases in coal mines, dwelling houses, or other places.* Dated Oct. 28, 1857. (No. 2727.)

This consists in employing small balloons filled with hydrogen, and attached to strings, so that, by rising or falling in the atmosphere of the workings of a mine, the presence or absence of hydrogen or carburetted hydrogen may be indicated. To destroy these gases, they are to be fired either by the electric spark, or by a rocket attached to a wire, extending from one end of the working to the other.

Luedeke, J. E. F. *A new or improved motive power engine.* Dated Oct. 28, 1857. (No. 2728.)

This consists of a vessel immersed in water, one of the sides being provided with a piston or flexible material, so that, when depressed in the water, the air in the vessel may be compressed. The vessels

to be either made to move in the water by being mounted upon an axis, or rise and fall in the water by a vertical motion.

MAURY, P. A. M. *Improvements in cutting the pile of velvets and other pile fabrics.* Dated Oct. 28, 1857. (No. 2730.)

This consists in the employment of stationary cutters equal in number to the loops in the breadth of the fabric to be cut, and carried by a suitable holder placed across the fabric which is made to move over a table beneath. The cutters are each provided with a small guide point, which enters the loop in front of it as the fabric moves forward, and guides the loop on to the cutting edge, which is fixed upward. In advance of the cutters is a fan or blower for driving off the dust produced by the cutting.

WEST, A. *Improvements in the manufacture of candles.* Dated Oct. 28, 1857. (No. 2731.)

This relates to the manufacture of candles from paraffine and Belmontine. The patentee has discovered that, if there be employed two or more wicks to each candle when paraffine is used, a flame free from smoke may be obtained. More than two wicks may be used. He prefers plaited wicks.

SHILLIBEER, G., and G. GILES. *Improvements in omnibuses.* Dated Oct. 28, 1857. (No. 2733.)

This consists in so arranging omnibuses that the outside places or seats, or some of them, may be accessible from the interior of the vehicle.

SLOPER, J. *Improved means of, and apparatus for, obtaining motive power for propelling ships or driving machinery.* Dated Oct. 28, 1857. (No. 2734.)

This relates to a mode of obtaining power from the wind by means of a series of arms, or of a vertical framework provided with sails or vanes, and connected to a central main shaft mounted vertically in bearings. These sails or vanes may be made to admit of their being set at any desired angle. They are also arranged round the central shaft.

CLARK, W. *An improvement in rails for railways.* (A communication.) Dated Oct. 28, 1857. (No. 2735.)

This consists in forming an inverted T rail with an aperture or hollow space extending lengthwise through the thick upper portion of the rail.

CLARK, W. *Improvements in the manufacture of murexide.* (A communication.) Dated Oct. 28, 1857. (No. 2736.)

This consists in neutralising a cold solution containing alloxan and alloxantine with ammonia or carbonate of ammonia, added in small portions and at intervals, and in afterwards heating this solution to 140 or 170 degrees Fahr.

CLARK, W. *Improvements in machinery for carding cotton, wool, and other fibrous substances.* (A communication.) Dated Oct. 28, 1857. (No. 2737.)

This relates to the employment of a stripping cylinder below the axis of the main cylinder of a carding engine, for stripping the teeth of the main cylinder as they pass from the doffer towards the licker in, while the engine is in operation.

NEWTON, W. E. *Improvements in the manufacture of sewing silk, twist, and different kinds of thread.* (A communication.) Dated Oct. 28, 1857. (No. 2738.)

This consists, 1. In a method of forming a single thread into three strands preparatory to, or while undergoing, a twisting or spinning process, and then spinning the three strands into a thread by means of certain mechanism which constitutes the 2nd part of the invention, but which cannot be described without engravings.

CHILD, J. and J. *A double barrelled gun with an elevated rifled tubular rib.* Dated Oct. 28, 1857. (No. 2740.)

This consists of an additional barrel or tubular rib placed between the two barrels, say of an ordinary double barrelled gun, such rib or barrel being bored and rifled, and the loading of it effected with the small end of the ramrod, while the other barrels may be loaded in the ordinary way: to discharge the centre barrel, the patentees secure an additional striker on the nose of either of the other cocks.

TAYLOR, H. *An improvement in the "cans" employed in connection with machinery for preparing cotton and other fibrous materials for spinning.* Dated Oct. 28, 1857. (No. 2741.)

This is designed for providing a substitute for tin of which the "cans" are made, and consists in making them of ordinary sheet iron, the surfaces of which are submitted to the action of acids, to destroy the scale or rough exterior, and render it as smooth as tin, in order that the fibres may not adhere thereto.

RONALD, R. A. *Improvements in the manufacture of shawls.* Dated October 28, 1857. (No. 2743.)

This relates to the manufacturing of shawls so that a single shawl may be made to present the external appearance of three or more separate articles of wearing apparel. Under one modification the shawl is made of "chenille," to the ordinary fringe of which is attached a secondary fringe. These shawls may be so woven as to present a distinct appearance upon each side of the fabric. One corner of the shawl is rounded off, whilst the others are left as usual. When the rounded part is worn outside, the shawl has the appearance of a mantle, whilst if the angular corners are turned outwards it has the appearance of an ordinary shawl. Other modifications are included.

GREENING, W. *Improvements in enamelling and ornamenting metals and other surfaces.* Dated Oct. 28, 1857. (No. 2744.)

This consists in subjecting the ordinary colours used for enamelling to the action of lime water or other alkaline solution. The patentee proposes to produce a marbled pattern by floating the colours upon water agitated in any convenient way, or by the use of a galvanic battery. He also proposes to obtain ornamental effect by adding to the colours used different metals, such as gold, silver, &c., in the form of fine dust, filings, or foil. In this case the specific gravity of the water should be increased by the addition of potash, chloride of sodium, or any other agent free from acid, so as to float the metals to be used.

COOK, T. *Improvements in machinery for cutting, framing, and packing lucifer and other like wood matches.* Dated Oct. 29, 1857. (No. 2748.)

This consists in the construction and application of machinery for cutting wood for matches, filling the frames used for dipping them, and removing and depositing the same in boxes. The machinery cannot be described without engravings.

ALLISON, D., and J. LIVINGSTON. *Improvements in machinery or apparatus for regulating the weight or pressure to top rollers used in spinning or preparing fibrous materials to be spun.* Dated Oct. 29, 1857. (No. 2749.)

According to one modification, the patentees employ one weight only, or a weight acting on a lever, for giving pressure to top rollers, either mode giving its effect upon all the hooks or wires, and consequently the rollers at the same time, by passing an endless band or chain over the hooks or wires, or over pulleys connected to them, and also under and over points of resistance on each side of the hooks or wires, and causing the weight to act upon the middle of the band. The entire pressure is taken off the rollers at once, by lifting the weight on to a catch.

PADGETT, W. *The manufacture of earthenware pipes for drains and sewers.* Dated Oct. 29, 1857. (No. 2750.)

Here, the patentee makes each pipe or tube with a welt or convex projection at or near each of the ends thereof, and he makes socket bands or collars in pieces, so that when put together they will form a hollow collar with an annular recess within it, so as to receive and hold the welts.

CRAVEN, J. *Improvements in machinery or apparatus used in weaving.* Dated Oct. 29, 1857. (No. 2751.)

These relate to the jacquard, and consist, 1. In giving independent motion to the bottom or knot board, in order that a downward motion may be given thereto at the time of giving upward motion to the frames of lifting blades to form sheds. The ordinary lifting frame, and the bottom or knot board, are operated by separate levers and cranks, capable of being shifted to vary the times of operating the parts in relation to each other. 2. To giving independent motion from the loom shaft to the card cylinder. Also, to providing for giving motion to the cylinder in either direction by a lever handle operating catches which take into the pins of the cylinder.

SMITH, E. *An improved safety hook or fastening, particularly applicable to securing watch chains and watches to waistcoats and other garments.* Dated Oct. 29, 1857. (No. 2752.)

This hook is constructed in three main parts. 1. A button or rosette. 2. A tube fixed to the back of the button. 3. A hook, one end of which enters the tube, and is firmly held therein, but so that it may turn entirely or partially round in it, while the other end of the hook, when the attachment is complete, forms a spring, and enters a small groove or nick made for its reception in the fore and under part of the button, &c. To open the hook, it is necessary to push that end of the hook which is not held in the tube laterally.

ROBINSON, G. W. *Improvements in clod-crushing rollers.* Dated Oct. 29, 1857. (No. 2753.)

Each roller is composed of numerous sections or rings, but the periphery of each ring is made with spikes, the outer sides of which are curved; the other sides incline from the periphery to the point. Each alternating ring or section has a hole at the centre, for turning on a cylindrical axis, and it has on one side a projecting boss on which the next ring or section is received, and on which it turns freely. The rings or sections are connected to their central naves or bosses by spokes.

FRASER, J. B. *An improvement or improvements in lubricating shafts, axles, screws, and other articles requiring lubrication.* Dated Oct. 30, 1857. (No. 2756.)

This consists in lubricating journals, bearings, &c., by oil contained in a reservoir situated below or in the bearing, &c., to be lubricated, and raising the oil therefrom by means of an endless band passing around the axle, the band dipping into the oil, &c., and carrying up portions thereof.

CLARK, W. *Improvements in tackle blocks.* (A communication.) Dated Oct. 30, 1857. (No. 2757.)

This applies to pulley or tackle blocks of all kinds, and it is intended, 1. To impart great strength by substituting for the strap of rope, or of iron, usually surrounding the exterior of pulley blocks, an interior and exterior band of metal, which will not separate from its wooden case when the axle breaks or drops. 2. To prevent the sheave coming out of the slot or space of the block if the axle should break or fall, by placing the nave of the sheave in a slide made for this purpose. 3. To render the action of the sheave more free than in ordinary tackle pulley blocks. 4. To render the pulley block capable of undergoing several modifications with facility by means of change pieces. 5. To be able to connect and disconnect easily and quickly the parts of the block which wear.

SHIELDS, W. *Improvements in machinery or apparatus for etching, engraving, and cutting cylinders and other surfaces, to be used in printing and embossing.* Dated Oct. 30, 1857. (No. 2758.)

This refers to machines in which a tracer is employed, to be passed over the design to be copied, the motions of which tracer are followed by an etching or cutting instrument.

HARWOOD, W. *Improvements in reaping machines.* Dated Oct. 30, 1857. (No. 2759.)

This invention was described and illustrated at p. 601, No. 1820, Vol. 68.

DAVY, J., and W. BENTLEY. *Certain improvements in looms for weaving.* Dated October 30, 1857. (No. 2760.)

This relates to "pick-and-pick" looms, and consists in adapting to them mechanical arrangements for taking two or more picks alternately at each end of the loom. The patentees employ cams made with sliding noses, the same being connected with mechanism for throwing the sliding noses either into or out of contact with the axis of the picking sticks. They are thus enabled to work any number of picks, according to the variations of colour in the weft.

PRIDEAUX, T. S. *Improvements in apparatus for regulating the supply of air to furnaces.* Dated Oct. 30, 1857. (No. 2762.)

The patentee claims, 1. The simultaneous introduction of air by a self-acting apparatus at the mouth and back of the furnace, and the application of a self-closing valve to the interior of the furnace mouth, the edge of the valve box shutting against the margin of the furnace, instead of entering within it. 2. Regulating the supply of air to furnaces with a surplus power of draft by connecting the damper with a gradually self-closing apparatus. 3. Regulating the supply of air to furnaces, where the draft is assisted by a steam jet, by placing this jet under the control of an automatic apparatus which, upon increasing power being given to the jet after coaling, shall gradually reduce this power to the average pitch demanded. 4. Regulating the supply of air to the kilns or furnaces used in the manufacture of pottery, by a self-closing valve in communication with air chambers at the sides of the fire-place. 5. The employment in self-acting apparatus of the principle of the balance, wherein a vessel moving freely on a horizontal axis fluid descends to a position less distant from the line of support by a series of steps. 6. The employment of the principle of immersion, or the float, where the cistern is a closed vessel, entered by a closely fitting axle. 7. The application of flexible vessels in the construction of self-regulating apparatus.

KNOWLES, S. *Improvements in "dunging" fabrics preparatory to dyeing.* Dated Oct. 30, 1857. (No. 2763.)

The patentee "pads" or otherwise impregnates the mordanted piece in a mixture of dung and water, and immediately runs the pieces rapidly through a steam chest, and then washes them thoroughly, after which they are at once ready for dyeing.

STODART, M. *An improvement in the construction of the sound boards of pianofortes.* Dated Oct. 30, 1857. (No. 2764.)

Here, in place of making the sound board of a pianoforte of the same thickness on each side of the bridge, it is reduced in substance from the bridge towards each edge of the sound board, where it is fixed.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

ELLENA, A. B. *A new mechanical means of rocking cradles.* Dated Oct. 14, 1857. (No. 2624.)

This consists of an arrangement of wheels and pinions by which a cradle, having been wound up, will be kept going for some time.

PRIESTLEY, F. *Improvements in signal instruments, or apparatus for making or transmitting electric telegraph signals.* Dated Oct. 15, 1857. (No. 2638.)

This invention offers the advantages of Bain's system (not in respect of a continuous message, but) in respect of the several separate compound signals which may require to be made by simplifying the manipulation or work to be performed by the operator in the transmission or formation of such signals, and consists in constructing electric

telegraph signal instruments with a series of handles or keys, for producing various compound signals, in such manner that one mechanical effort of the operator exerted upon any one of such handles or keys shall transmit the several simple signals of which the particular corresponding compound signal is composed. The invention is in some respects similar to the ordinary "step by step" or dial signal instruments, but the latter do not provide a separate or distinct movement in respect of each different compound signal, but require the same movement in every case, varying only in the extent or degree to which it is to be made.

Hopper, W. B. *Improvements in floating docks.* Dated Oct. 15, 1857. (No. 2640.)

This consists of a platform for receiving the ship, and having under it air vessels of sufficient capacity to support the platform with the ship upon it above the water level.

Walker, C. *Improvements in atmospheric railways.* Dated Oct. 15, 1857. (No. 2644.)

This relates to the working of such railways with "a solid tractive or propulsive pipe," in place of the usual slotted or open valve pipe. The working piston traversing the pipe is connected to the two ends of a traction chain or rope, which pass out of the pipe, being supported externally along the pipe in carrying pulleys.

Walker, C. *Improvements in the manufacture of manure from sewerage or drainage matters.* Dated Oct. 15, 1857. (No. 2645.)

This consists in filtering sewage through short vertical pipes covered at the upper ends with perforated slabs, and collecting the material that accumulates for use as manure.

Wright, R. *Improvements in the application of certain fluid and other matters to heating purposes, and in apparatus for the same.* Dated Oct. 15, 1857. (No. 2647.)

This relates to the application of certain fluid and other matters to heating purposes. The inventor encloses oil or fatty matter in tubes of circulation carried to the point it is desired to heat, and placed in communication with a peculiar construction of fire-box described by which the oil or other matter is heated. To facilitate the circulation of the oil, the inventor sometimes applies a screw or other mechanical means. By using oil or fatty matters as the medium of heating, he is enabled to transmit a high heat without generating any pressure in the coils, and the tubes are not subject to internal corrosion. The inventor applies this system to the generation of steam, desiccation, heating rooms, &c.

Brooman, R. A. *An apparatus for scoring games and points at games.* (A communication.) Dated Oct. 16, 1857. (No. 2653.)

This apparatus consists of a box or case with two sets of dials, one on each side; at one end is a holder for cigars, and at the opposite end a match-holder; there are also rests for holding lighted cigars. By turning the pointer to indicate any particular score on one side of the apparatus, the same score is indicated to the adversary on the opposite side. A drawer is provided at the bottom of the scorer for holding cards, counters, &c.

Chadwick, J. *Improvements in rollers or cylinders for printing or staining the surfaces of woven fabrics, yarns, paper, and other materials.* Dated Oct. 16, 1857. (No. 2654.)

1. The inventor takes the ordinary copper or other roller, and, by cutting or otherwise, gets in relief the parts intended to give the impression. He proposes to etch or engrave the said relieved parts in lines or cells, as with ordinary engraved printing rollers, so that the lines or cells shall carry more colour than an absorbent substance. 2. He takes a roller, engraves or etches it as for ordinary printing rollers, and polishes it ready for use.

Holt, T. *Improvements in looms.* Dated Oct. 17, 1857. (No. 2655.)

This relates to fancy looms, and consists, 1. In employing an improved arrangement for the formation of fancy patterns, by means of lifting the healds by hooks, which are pressed upon, a knife or lifter continually moving up and down when the loom is in motion. 2. In an improved shuttle box motion. 3. In an improved taking up motion.

Humphreys, E. *Improvements in engines worked by steam or vapour.* Dated Oct. 17, 1857. (No. 2658.)

In engines worked by vapours of a volatile liquid, to prevent the vapours escaping, and to maintain the temperature of the parts, the cylinders, with their covers, bottoms, stuffing-boxes, valve-boxes, and the supply pipes, are all enclosed in a steam-tight case having stuffing-boxes for the passage of the rods. This case is to be kept supplied with steam of higher pressure than the vapour in the engines.

Lewenberg, L. *Improvements in railway alarms and marine alarms or fog signals.* Dated Oct. 17, 1857. (No. 2663.)

This consists in the arrangement of metallic springs within a series of rings, in such manner that the springs shall be represented by a hollow metallic drum with plates or ribs along its surface, parallel to the axis, whereby the vibration of the metallic springs and drum, when the drum is rotated, produces a sharp and powerful sound.

Cavalerie, M. F. *Improvements in obtaining motive power, and in the apparatus connected therewith.* Dated Oct. 19, 1857. (No. 2668.)

This consists in the employment of compressed air in combination with water used as a resisting medium for obtaining motive power, and in certain apparatus for the purpose.

Brooman, R. A. *Improvements in producing figured fabrics in which the design is applied by printing.* (A communication.) Dated Oct. 19, 1857. (No. 2669.)

This consists in printing the weft threads employed in producing figured fabrics in colours in the following manner. The thread to be printed is led around rollers at each end of a printing table, and between these rollers, and near to them, are placed combs (one at each end), by means of which the several threads are kept parallel to and separate from each other. On each side of the printing table is placed a graduated scale, the opposite graduations corresponding. A number of small printing sticks are next arranged in a holding frame, to correspond with the reading off of one element of the design. These sticks are then supplied with the required colour, and applied carefully to the threads, their positions being determined by the scales. The frame with the sticks is then moved along the threads over a distance equal to the length of one element of the design, and the printing is then repeated. In this manner the weft is coloured as required, and, when made up into a fabric, will be found to produce the intended design.

Barnard, B., and A. Rosenthall. *A new ornamental fringe or fringed fabric, also the means of producing the same.* Dated Oct. 19, 1857. (No. 2670.)

The inventors afford to the fringe, or that part of a fabric which is to form fringe, a sufficient body, or consistency, to receive an impression in the ordinary method of printing upon textile fabrics. They employ warp threads in the fabric which is to form the fringe, and then print the desired pattern thereon. After the printing is completed, they withdraw the warp threads, when the design will appear upon the fringe, and the portions of the fabric from which the threads have been withdrawn will be crimped; thus an entirely new fabric, namely, a printed crimped fringe, is produced.

Garvey, B. *Improvements in apparatus for determining position and direction on land and sea.* Dated Oct. 19, 1857. (No. 2676.)

The inventor makes use of a continuously revolving wheel, so mounted that it is free to continue its rotation in planes parallel to that in which it was first set to revolve, irrespective of the motion of

the earth or any disturbing cause, thereby obtaining a normal plane or base for use in determining position or direction on land or sea, for the purposes of navigation, geology, or astronomy.

BRIGGS, E. *An improved manufacture of printed piled fabric.* Dated Oct. 20, 1857. (No. 2679.)

A fabric is woven in the ordinary manner with a silk weft, which is cut and raised to form a piled surface; this surface is then printed to any required pattern, and again raised or finished to complete the fabric.

CLARK, R. *Improvements in effecting the consumption or prevention of smoke, applicable to steam boilers and other furnaces.* Dated Oct. 21, 1857. (No. 2686.)

This relates to the mode of causing the unconsumed gaseous products of one fire to pass through or over the incandescent fuel in another.

HINKS, J. *An improvement or improvements in stiffeners for wearing apparel.* Dated Oct. 22, 1857. (No. 2692.)

This consists in constructing stiffeners for ladies' petticoats, &c., of narrow strips of thin sheet steel, joined together to make long lengths. The inventor pierces two holes in each of the ends to be joined, and, placing the ends upon one another, inserts eyelets, and, by expanding them, fastens the strips together. The strips are pierced with holes for attaching them to the garment.

SAUNDERS, D. H. *Improvements in the preparation and manufacture of textile fabrics and materials.* Dated Oct. 22, 1857. (No. 2698.)

This relates essentially to the simplification of the intermediate processes of converting yarns into woven fabrics, and consists of arrangements whereby yarns of various kinds, as spun and wound on to suitable bobbins or holders, may be woven into cloth without the intervening processes of reeling and winding.

BAND, T., and G. BECKLEY. *An improvement in saddle-trees.* Dated Oct. 23, 1857. (No. 2700.)

The inventors make the two longitudinal side pieces of thick sole leather, strengthened on the upper side by a flat strip of steel reaching from end to end. The fore part of the saddle-tree is composed of an arch of iron or steel, and is secured to the longitudinal side pieces, as is also the back of the saddle; but this is made of wood, as usual. The covering flaps and panels of the saddle are mounted on the saddle-tree in the usual manner.

PARKER, B. *Improvements in the permanent way of railways.* Dated Oct. 23, 1857. (No. 2701.)

This consists in forming hollow cast-iron sleepers with downward bevelled flanges forming the sides and ends, the surfaces of such chair being bored with holes to reduce the weight thereof, and enable the ballast packing to be rammed up and consolidated for adjusting the position of the sleeper upon the road.

BLAKELY, A. T. *Improvements in laying submarine telegraphic cables.* Dated Oct. 23, 1857. (No. 2702.)

This consists in attaching to submarine telegraphic cables boards, or other suitable resisting surfaces, in such manner that they shall be perpendicular, or nearly so, to the cable as the latter sinks; and the inventor attaches these to the cable as it leaves the ship.

KIRKMAN, F. C. *Improvements in machinery for winding and unwinding ropes and cables, which is applicable to electric cables for submarine purposes.* Dated Oct. 24, 1857. (No. 2705.)

This relates to a method of winding and unwinding ropes and cables upon a vertical drum or core, attached to a base or flooring caused freely to rotate, instead of their being coiled on stationary flooring, by which latter means kinks and snares are produced.

PEARSON, J. M. *Improvements in the manufacture of coke.* (A communication.) Dated Oct. 24, 1857. (No. 2709.)

This consists in constructing coke ovens in pairs, so that the waste heat from each oven is applied to that next to it by means of flues, before passing into the chimney. By charging the ovens alternately, neither is allowed to get cold.

WARD, F. O. *Improvements in the construction of roller blinds.* Dated Oct. 26, 1857. (No. 2710.)

Roller blinds, heretofore capable of working only in a straight line, are rendered capable by these improvements of being adapted to and working in any required curve or bend or varied outline, such, for example, as that of a circular-fronted brougham, or the bow window of a house, or of a window partly straight and partly curved.

JONES, I. *Improvements in the manufacture of sheet glass.* Dated Oct. 26, 1857. (No. 2712.)

In place of flattening blown glass on a "larger," as is now done, the glass cylinders, having been cut with a diamond in the usual way, are inserted in a flattening kiln, and heated to admit of their being opened out, which is done by taking hold of one edge of the glass with nippers, and raising it up so as to allow the cylinder to unroll itself and fall vertically down by its own weight.

HORROCKS, J. *Improvements in winding machines, and in the bobbins employed therein, and also improvements in shuttles for weaving with such bobbins.* Dated Oct. 26, 1857. (No. 2714.)

This relates to pin-winding machines, for winding yarns upon pin bobbins for weaving, and is designed for dispensing with the spindles on which the bobbin is usually placed in the winding machine, and also the tongue or spindle on the shuttle employed for the same purpose. The improvements consist in the employment of a solid bobbin, driven by a wharve or pulley, through which the bobbin passes.

LEE, J. W. *Improvements in communicating between the different parts of railway trains.* Dated Oct. 26, 1857. (No. 2715.)

This consists in arranging speaking tubes from one carriage to another, and from the carriages to the guards and drivers of trains.

MARKS, A. *An improved fastening for gloves and other articles.* Dated Oct. 26, 1857. (No. 2717.)

This consists of an elastic or other cord attached to a kind of hook; and, after passing the cord or band round the wrist of the wearer, it is passed inside the hook, and turned at right angles to hang down, it having a tassel and knot, which, when passed under the hook, forms a stop, and secures the glove.

CADBY, C. *Improvements in pianofortes.* Dated Oct. 27, 1857. (No. 2719.)

This relates to the sounding-board, and to enabling pianofortes to sustain the downward pressure of the strings on the bridge. The inventor places at the back of the sounding-board a second sounding-board, the two forming a kind of box or chest, called a "sound chest." Beneath the bridge on the sounding-board he places a number of flat springs, so arranged that part of the inner side of the sounding-board immediately below the bridge rests on the top of the flat springs, and is supported thereby, the downward pressure of the springs being counteracted by the resistance and elasticity of the springs beneath.

MOTTRAM, T. *Improvements in knife handles.* Dated Oct. 27, 1857. (No. 2720.)

These consist in substituting oval handles turned at one operation in a lathe, and secured by rings or shields embracing the rivets for the handles at present attached to butchers' knives, or other knives, with flat tangs, which are formed by files or hand, and secured by rivets countersunk in the wood.

MARGETSON, R. A. *Improved means of communicating between the guard and driver on railways.* Dated Oct. 27, 1857. (No. 2722.)

Two whistles of ordinary construction, one having a sharp and the other a flat tone, are acted upon by compressed air, led from a vessel to which they are connected by tubes furnished with stop cocks.

MENNONS, M. A. F. *An improved varnish.* (A communication.) Dated Oct. 27, 1857. (No. 2723.)

This consists in the preparation of varnish from the following materials: Benzine, about 2½ oz.; gum

copal, 5 drachms; bitumen of Judea, 4 drachms; resin, 1½ drachm; dissolve and add essence of turpentine, 1 oz.; sulphuric ether, 1½ drachm.

URIE, R., and W. SUTHERLAND. *Improvements in the manufacture of knitted and weft-netted warp fabrics.* Dated Oct. 27, 1857. (No. 2724.)

This consists in employing printed or parti-coloured threads or yarns in the stocking frame, and other looms, commonly known as the barehead nett frames or looms, so as to produce fabrics with regular figures or patterns, in place of using in such machines plain threads or yarns, or threads or yarns each coloured from end to end with one colour.

IRLAM, W. *Improvements in wrought-iron railway chairs, sleepers, and crossings.* Dated Oct. 28, 1857. (No. 2725.)

This consists in making railway chairs in two parts, and in securing them together by a bolt passing through them and the body of the rail; the chair is then secured to a sleeper, or to a wrought-iron plate forming the sleeper.

SMITH, W. *Improvements in couplings or connections for shafts.* (A communication.) Dated Oct. 28, 1857. (No. 2729.)

This consists in forming coupling boxes by means of two flange pieces having collars or shoulders cast upon them, similar to the ordinary flanged coupling at present in use, and formed with certain grooves or openings.

BOURGEOIS, A. *An improved preparing liquor for tanning hides and skins.* (Partly a communication.) Dated Oct. 28, 1857. (No. 2732.)

This consists in subjecting bark and other materials used for obtaining tanning liquor to distillation, and using with water the liquor remaining in the still in the ordinary manner.

MCDOWALL. *Improvements in steam hammers.* (A communication.) Dated Oct. 28, 1857. (No. 2739.)

This relates to an arrangement of the parts of steam hammers, and to a mode of actuating the hammer, which cannot be described without engravings.

FRASER, J. *Improvements in the manufacture of saltpetre.* Dated Oct. 28, 1857. (No. 2742.)

This consists in decomposing muriate of potash or chloride of potassium with nitric acid.

DELF, W. jun. *Improvements in ploughs.* Dated Oct. 29, 1857. (No. 2745.)

This consists in making ploughs with a point running before for opening the furrow, and having behind a V-shaped share. Attached to the hind part of the implement are two short breasts, for turning the soil out of the furrow. Linked on to a bolt descending perpendicularly from the stump of the beam, are two metal rings, so formed as to scrape or slide out such stuff to any part of the land. A simple lever arrangement is provided between the handles for raising and turning the plough.

GOURLEY, D. DE LA C. *Improvements in ambulance carriages.* Dated Oct. 29, 1857. (No. 2746.)

The body of each carriage contains on its bottom two stretchers, side by side. The stretchers have each on their under sides four rollers, to facilitate their being moved on the bottom of the carriage; or such rollers may be applied to the carriage. Each stretcher is made with two sliding handles at each of its ends, has folding legs, and is covered with waterproof fabric. The body of the carriage is on springs, and on a single axle with two wheels. Each carriage is made for carrying two persons on the outside, for which purpose there is constructed a folding seat at the top on each side, and a footboard or rest to each seat. To produce a back to each seat, the roof of the carriage is raised, and covered in a-top, around which a rail is formed for enclosing knapsacks and other articles. Each side seat is made for four persons in a sitting position, and the front of the roof is made with two seats, having a box or space between.

FELOJ, P. *The improvement of an illuminating reflector of light from gas, oil, or candle.* Dated Oct. 29, 1857. (No. 2747.)

This consists in the construction of a reflector composed of small pieces of looking-glass, coloured or not.

EVANS, J. *Certain improvements in the method or methods of affixing or securing patterns and designs upon rollers and blocks used for imprinting on paper and other substances.* Dated Oct. 30, 1857. (No. 2754.)

This consists in enveloping a roller with felt, &c., to about one-eighth of an inch in thickness, driving the metal through the felt into the wood below, and then, by clearing away the superfluous felt, &c., the figure will be left in relief already filled in.

CHARLESWORTH, H., and W. CHAPMAN. *Improvements in machinery or apparatus for preparing woollen or other fibrous substances to be spun.* Dated Oct. 30, 1857. (No. 2756.)

This relates to the condenser, and consists in the use of a card roller or stripper, formed by the application of cards so as to form bands or rings of cards around its circumference, leaving a space of about the width of the cards between, and arranged so as to correspond with the rings of cards now formed on the doffer cylinder, so that each ring of cards on the stripper will only strip or doff the wool from each alternate ring of cards on the doffer, in like manner as the comb plates now used as the first or low "rubbers" do, leaving the other rings to be stripped by the next or upper stripper as heretofore.

LAWSON, J. *Improvements in machinery for roving flax and other fibrous substances.* (Partly a communication.) Dated Oct. 30, 1857. (No. 2761.)

This consists in a method of regulating the speed of revolution of the bobbins, and of the rise and fall of the copping rail. The train of wheels by which the motions are communicated to the bobbins and the copping rail is driven by an axis, having a disc mounted on it. Against the upper and under surfaces of this disc two friction wheels driven at a uniform speed revolve, and each time that the copping rail arrives at the end of its course the usual escape motion causes the friction wheels to move further from the axis of the disc, and consequently they communicate a slower motion to it. The friction pulleys are caused to nip the disc by springs, and the disc is mounted on the axis so that it is free to slide on it longitudinally for a short distance.

VRAULT, H. J. and J. *An apparatus or mechanism for making signals on railways, and preventing collisions on the same.* Dated Oct. 31, 1857. (No. 2766.)

The action of this apparatus is as follows: When the line is clear, a bar is raised above the centre of the line about 4 inches. The bar is driven in by a wheel fixed on the fender of the locomotive whereby a disc is turned at the departure of the train. By means of a chain rod and gear wheels the bar of the next apparatus is raised, whereby the disc is turned, and the passage of the train is signalled. The train arriving at that station, its locomotive drives in the bar, and removes both the discs there and at the former station, thus showing the line to be clear.

OWEN, J. *Certain improvements in machinery or apparatus for the prevention of accidents, applicable to hoisting and other lifting machines.* Dated Oct. 31, 1857. (No. 2767.)

This consists in an arrangement of levers in connection with a handle. To the levers are connected a series of catches, which may, by the movement of the handle and levers, be either forced outwards into suitable upright bars or rods, extending from the top to the bottom of the hoist or well hole, or to close inwards and grip the bars, and such bars may have notches formed therein, into which the catches may be thrown. Thus, when an attendant within the chamber finds it descending at too great a speed, by means of the handle he may bring the catches into contact with the rods or bars, and thus stop the descent.

PROVISIONAL PROTECTIONS.

Dated May 7, 1858.

1083. W. Duff and J. Gilchrist, of Liverpool, engineers. Improvements in apparatus for measuring water and other fluids, also capable of being used as a motive power.

Dated May 21, 1858.

1138. W. Clark, of Chancery-lane. Improvements in the processes of treatment of peat, and of the hydrocarburets it contains, and in the apparatus for the same. A communication.

Dated May 25, 1858.

1168. P. Griffiths, of Burnley, engineer. Improvements in manufacturing bushes for fixing drums on shafts, and other similar purposes.

Dated May 26, 1858.

1178. J. Luis, of Welbeck-street. An apparatus for cutting square-headed corks, and for corking bottles with the same. A communication.

Dated May 27, 1858.

1192. W. Clark, of Chancery-lane. Improvements in preserving butter. A communication from L. Belin.

Dated May 29, 1858.

1208. J. Shuttleworth, of Lincoln. Improvements in portable and other steam engine boilers.

1210. W. and H. Hodgson, of Bradford, York, tool-makers. Improvements in machinery or apparatus for preparing and spinning or producing motley yarns from rovings of unequal thicknesses of wool or other fibrous substances.

1212. S. Rockett and J. J. Reynolds, of the Strand, umbrella manufacturers. Improvements in the manufacture of umbrellas and parasols.

Dated May 31, 1858.

1220. J. B. Thornber, of Halifax, York, gentleman. Improvements in carriages for children, commonly called "perambulators," which improvements are also applicable to invalid and other carriages.

1222. G. K. Snow, of Watertown, United States. A new and useful machine for affixing postage stamps to letters.

1224. H. Jaeger, of Paris, gentleman. Improvements in dyeing wool. A communication.

1226. J. Austin and J. Armstrong, of Wellington, Salop, manufacturers. An improvement or improvements in the manufacture of coke.

Dated June 1, 1858.

1228. A. Barchou, of Cranbourn-street. A heel for boots and shoes.

1230. A. G. Grant, of New York, photographic artist. A method of preparing paper in order to render it waterproof and adapted for the reception of photographic pictures.

1232. R. W. Chandler, of Bow, engineer, and T. Oliver, of Hatfield, farmer. Improvements in agricultural apparatuses for ploughing and otherwise operating upon land.

Dated June 2, 1858.

1234. F. J. Candy, of Haslemere, Surrey, master of arts. Improvements in machinery for the manufacture of fishing and other nets.

1236. J. Luis, of Welbeck-street. A new farming implement, called the gleaner. A communication.

1238. D. Service, of Barrhead, Renfrew, block cutter. Improvements in apparatus for producing printing surfaces.

1240. H. Brown, B. Hodgson, and J. Carter, of Halifax, York. Improvements in machinery for introducing and withdrawing wires when weaving.

1242. R. Roberts, of Heaton Norris, machine maker, and W. Shaw, of the same place, foreman. Certain improvements in looms for weaving.

Dated June 3, 1858.

1244. J. Meiklejon, of Dalkeith, horticultural engineer. Improvements in boilers for heating water, and in valves for controlling and regulating the flow or passage of the same.

1245. R. Owen, of Manchester, gentleman. Improvements in water-closets, night-commodes, or similar conveniences, and also in disinfecting processes.

1246. W. Clayton and J. Goodfellow, of Blackburn, engineers. A certain improvement in pistons for pumps.

1247. J. Bethell, of Parliament-street, Westminster, gentleman. Improvements in the manufacture of alum.

1249. A. V. Newton, of Chancery-lane. An improved manufacture of woven fabric, applicable chiefly where strength and durability are required. A communication.

1250. G. Dalton, of Lymington, gentleman. Improvements in furnaces for smelting the ores of iron and other minerals.

1251. J. Mitchell, of Dunning's-alley, Bishopsgate-street, assayer. Improvements in purifying paraffine.

1252. R. Owen, of Rotherham, gentleman. Improvements in the manufacture of railway wheel tyres, and in machinery employed therein.

1253. H. Edwards, of Dalston, gentleman. An improved pipe stem or tube.

1254. T. Wilson, of Chiswick. Improvements in the construction of mangles.

1255. J. Baron Von Liebig, of Munich. Improvements in protecting the silvered surface of mirrors and other articles of glass.

Dated June 4, 1858.

1256. W. Hargreaves and E. Haley, of Bradford, York. Improvements in machinery or apparatus for preparing and combing wool, hair, silk, cotton, flax, and other fibrous substances.

1257. E. M. Stoehr, of Manchester. Certain improvements in looms for weaving. A communication from J. A. Hense.

1258. J. F. Dickson, of Litchurch, near Derby, engineer. Improvements in the permanent way of railways.

1259. V. Merighi, of Paris, gentleman. Means for preventing dust on railroads.

1260. V. Merighi, of Paris, gentleman. Means for impeding and extinguishing fires in railway trains.

1261. T. and J. T. Crick, of Leicester, boot manufacturers. Improvements in the manufacture of boots, shoes, and slippers.

1262. R. Quin, of Rodney-street, Pentonville. Improvements in ordnance and fire-arms.

1263. R. A. Brooman, of 166, Fleet-street, London, patent agent. Improvements in preparing the fibrous portions of certain textile plants, and the employment thereof when prepared either alone or in combination with articles already in use for the purposes of stuffing. A communication.

Dated June 5, 1858.

1265. J. Banks, of Liverpool. An improved reaping machine.

1266. M. Page, of Valdoie, France, civil engineer. A steam or power kneading apparatus.

1267. H. Carter, of Manchester, gas engineer. Improvements in gas burners.

1268. C. Hancock, of West-street, Smithfield. Improvements in the manufacture of electric telegraph cables.

1269. E. Cooke, of Smethwick, Stafford, manager of works, and G. Dickinson, of Smethwick, manufacturer. Improvements in the manufacture of metallic and other bedsteads, and other articles for sitting, lying, and reclining upon.

1270. R. Orr, of Glasgow, thread manufacturer. Improved apparatus to be applied to various

machines used in the manufacture of yarn or thread.

1271. A. Manbré, of Rathbone-place, brewer. An improved method of preparing malt and other grain, and in extracting the saccharine matter therefrom, whether for the purposes of brewing, distilling, or otherwise.

1272. F. H. Whiteman, of Islington, gentleman. Rendering paper hangings, for decorating the interior of houses, capable of being washed by soap and water without detriment to the colours thereof.

1273. W. Porter, of Brompton, civil engineer. Improvements in artillery ordnance and some other descriptions of fire arms.

1275. G. Hadfield, of Carlisle, varnish manufacturer. Improvements in the protection of carboys or other vessels and packages.

Dated June 7, 1858.

1276. E. Scotson, of Clayton, Lancaster, and H. Chanley, of Preston. Improvements in machinery connected with traction and other engines, and in endless railways to be used therewith.

1277. J. Ferrabee, of Thrupp, near Stroud, engineer. Improvements in machinery for cutting, collecting, and spreading grass, and for sweeping.

1278. J. J. Rowley, of Rawthorne, near Chesterfield. Improvements in apparatus for applying lime, soot, and other matters to turnips and other crops, and manure to land.

1279. J. Boullenger and L. J. Martin, of Paris. An apparatus serving to the decomposing neutral fatty substances into fatty or oily acid and glycerine.

1280. J. M. Dunlop, of Manchester, engineer. Improvements in apparatus for sizing fibrous materials.

1281. H. Wimball, of Aldermaston, Berks, brick manufacturer. Improvements in machinery or apparatus for destroying the turnip fly and other destructive insects on growing crops.

1282. E. Vigers, of Paddington, gentleman. Improvements in the manufacture of bricks and other articles moulded or formed from clays.

1283. J. B. A. Lombard and X. T. Esquiron, of Paris. A new or improved method of obtaining saccharine substances from cereal and vegetable matters, and applying the products obtained to various useful purposes.

1284. R. Hicks, of Chatham-place, City, gentleman. The manufacture of a composition or compositions to be employed as black lead.

Dated June 8, 1858.

1285. J. M. Dunlop, of Manchester, engineer. Improvements in bowls or rollers used in machines for printing fibrous materials.

1287. I. Ketchum, of Liverpool, merchant. An improved self-acting perforated baster.

1289. R. A. Brooman, of 166, Fleet-street, London, E.C., editor of the *Mechanics' Magazine* and patent agent. Improvements in the manufacture of copper pipes and tubes. A communication from Messrs. Liébaut and Egrot.

1291. A. Robertson, of Sheffield, stove grate manufacturer. Improvements in stoves or fire grates.

1293. D. Irons, of Deptford. Improvements in the mariners' compass.

1295. A. Rigg, sen., and A. Rigg, jun., of Chester. Improvements in apparatus for tipping or upsetting coals, minerals, or other substances, and in brake machinery.

Dated June 9, 1858.

1297. F. A. Gatty, of Accrington, manufacturing chemist. Improvements in dyeing cotton and other fibrous materials and fabrics.

1299. S. Lees, of Salford, manufacturing chemist. Improvements in the manufacture of tan or tannin, and in tanning hides to make leather.

1301. B. C. Grimshaw, of Denton, Lancaster, block turner. Improvements in furnaces and steam boilers.

1303. C. F. Vasserot, of Essex-street, Strand. An apparatus for measuring and registering the flow of liquids. A communication from C. A. Boudier and A. Bartré, of Paris.

1305. P. Dumont, of Southwark-square, gentleman. Improved implements for distributing or applying powder.

1307. H. Rollinson, of Stepney. An artificial fuel.

1309. J. Roberts, of Upnor, Kent, terra cotta manufacturer. An improved construction of reflector or cover for gas burners.

1311. J. Roberts, of Upnor, Kent, terra cotta manufacturer. An improved construction of stove.

Dated June 10, 1858.

1313. T. W. Mellor, of Ashton-under-Lyne, manufacturer, and W. Jamieson, of the same place, machinist. Certain improvements in looms for weaving figured fabrics.

1315. J. Luis, of Welbeck-street. An improved thrashing machine. A communication.

1317. J. Luis, of Welbeck-street, London. An improved nosebag for giving horses their oats, &c. A communication.

1319. J. S. Crosland, of Ashton-under-Lyne, engineer. Certain improvements in steam engines.

1321. G. Hall, of Worcester, ironmonger. Certain improvements in cartridges.

1323. W. Wilkinson, of Bayswater, engineer. Certain new textile and other combined fabrics, and means of ornamenting fabrics and skins.

Dated June 11, 1858.

1325. J. Gemmell, of Belfast, starch manufacturer. Improvements in the manufacture of starch.

1327. L. A. Bigelow, of High Holborn, gentleman. A new and improved machine for sweeping carpeted and other floors. A communication.

1329. W. E. Newton, of Chancery-lane. Improved apparatus for supplying boilers with water. A communication.

1331. L. F. Leniere, of Canderan, France, manufacturer. Improvements in treating hemp or tow for the caulking of ships and vessels, parts of which improvements are applicable to washing and cleansing textile articles or fabrics impregnated with greasy or oily matters, and in the apparatus connected therewith.

Dated June 12, 1858.

1335. J. Hall, of Derby, marble mason. An improvement in the slide valves of steam engines.

1337. A. Gibson, J. Pollock, and J. Martin, of Stratford, engineers. Improvements in the construction of steam-engine boilers and furnaces for effecting the prevention of smoke.

1339. A. V. Newton, of Chancery-lane. Improved machinery for cutting veneers. A communication.

Dated June 14, 1858.

1341. J. H. Young, of Great College-street, Camden-town. Improvements in setting up (composing) and distributing types.

1343. H. N. S. Shrapnel, of Bradford, Wilts. An improvement in preparing iron and other metals or mixtures of metals for, and in casting the same in moulds.

1345. J. Hetherington, of Manchester, machinist. Improvements in guides or clearers used in machines for winding, reeling, and clearing threads of cotton, silk, and other fibrous materials.

1347. J. C. Henderson, of Albany, New York. Improvements in stoves.

Dated June 15, 1858.

1349. L. C. S. Masson, draughtsman, and F. de la Morinière, manufacturer, both of Paris. Im-

provements in the manufacture of woven fabrics with coloured patterns.

1351. G. Adshead, of Staley Bridge, Chester, spinner. Improvements in steam boilers.

1353. W. P. Wilkins, of Ipswich, engineer. Improvements in the arrangements and construction of refrigerating apparatus.

1355. H. S. Warner, of Trinidad, gentleman. Improvements in the manufacture of decolorizing and purifying charcoal.

1357. J. Rubery and T. Warwick, of Birmingham. Improvements in machinery and tools for making portions of umbrellas and parasols and lingoes.

Dated June 16, 1858.

1359. G. T. Bousfield, of Brixton. Improvements in apparatus to be used in the construction of small boats. A communication.

1361. C. W. Lancaster, of New Bond-street, gun manufacturer. An instrument or apparatus for charging cartridges for breech-loading arms.

1363. J. J. Cregeen, of Rotherhithe, doctor of medicine. Improvements in the treatment of India and China grass, pine-apple, hemp, flax, and other similar fibrous materials, and in the machinery or apparatus employed therein.

1365. J. C. Hill, of Abergavenny, Monmouth, iron master. Improved apparatus for ascertaining and indicating the height of water in steam boilers.

1367. G. Davies, of Serle-street, Lincoln's-inn. An improved equilibrium slide valve for steam engines. A communication.

PATENT APPLIED FOR WITH COMPLETE SPECIFICATION.

1380. B. Atwater, of Connecticut. An improved sewing machine. Dated 16th June, 1858.

NOTICES OF INTENTION TO PROCEED.

(From the "London Gazette," June 29, 1858.)

291. J. Garnett. "Paper."
303. R. Varvill. "Washing clothes."
304. W. Riddle. "Binding and fastening bales."
324. W. Skallitzky. "Socks and stockings."
326. W. E. Nethersole. "Railway carriages."
330. H. Edwards. "Stoppers for feeding bottles."
335. H. Rey-Rimels. "Potato meal or fecula."
340. W. Betts. "Enamelled paper."
348. F. Puls. "Hydro-carbons."
355. G. F. White. "Locks."
365. J. Petrie. "Regulating the flow of steam."
383. J. Morison, sen., and J. Morison, jun. "Jacquard apparatus."
396. M. Henry. "Electro-magnetic motors." A communication.
397. J. G., and W. M. Newey. "Fastenings."
408. J. Bircumshaw. "Dressing lace."
445. C. F. Parsons. "Animal charcoal."
448. G. Davies. "Substitute for red lead." A communication.
463. E. Morel. "Drawing fibrous substances." A communication.
489. J. Young. "Lamps."
586. A. V. Newton. "Sewing machines." A communication.
663. J. Baillie. "Coiled springs."
818. J. G. Jennings. "Sewers, culverts, arches, and other structures."
915. J. Braidwood. "Steam boilers and furnaces."
1042. W. C. Foster. "Bricks and slabs."
1096. W. Raymond. "Life rafts."
1102. S. Higgs, jun. "Precipitating copper from water."
1109. S. Higgs, jun. "Safety lamps."
1144. J. Foot. "Fringes."
1208. J. Shuttleworth. "Steam engine boilers."
1212. S. Rockett and J. J. Reynolds. "Umbrellas and parasols."
1238. D. Service. "Producing printing surfaces."
1240. H. Brown, B. Hodgson, and J. Carter. "Weaving."
1249. A. V. Newton. "Woven fabric." A communication.
1255. J. Von Liebig. "Mirrors."
1256. W. Hargreaves and E. Haley. "Preparing and combing fibrous substances."
1261. T. and J. T. Crick. "Boots, shoes, and slippers."
1270. R. Orr. "Yarn or thread."
1297. F. A. Gatty. "Dyeing cotton."
1333. G. T. Bousfield. "Marine steam engines." A communication.
1335. J. Hall. "Slide valves of steam engines."
1359. G. T. Bousfield. "Small boats." A communication.

The full Titles of the patents in the above List can be ascertained by referring back to their numbers in the Lists of Provisional Protections previously published.

Opposition can be entered to the granting of a Patent to any of the parties in the above List who have given notice of their intention to proceed, within twenty-one days from the date of the Gazette in which the notice appears, by leaving at the Commissioners' office particulars in writing of the objection to the application.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

1431. W. Teall.
1439. H. N. Penrice.
1456. F. Leiss and C. Schneider.
1458. M. Poole.
1480. A. E. L. Bellford.
1483. E. J. Hughes.

LIST OF SEALED PATENTS.

Sealed June 25th, 1858.

3168. A. Bruce.
3169. J. Barling.
3178. T. Spencer.
3180. J. D. Morrison.
3198. G. Wilson.
6. J. W. Clare.
8. R. Harvey.
12. F. Walton.
40. T. Rowell.
78. C. A. de la Brosse.
83. E. Wilson.
176. P. Ashcroft.
250. R. Aytoun.
450. R. S. Bartleet.
506. A. V. Newton.
633. W. Richards.
748. W. Nimmo.
769. Hon. W. Talbot.
900. W. Foster.
901. A. Jenkin.
910. J. Horton.
937. W. E. Newton.
972. J. H. Johnson.
992. W. E. Newton.

Sealed June 29th, 1858.

3187. F. Palling.
3188. T. Booth.

3190. J. O'Neill.
3192. J. Clinton.
3195. H. Hanson.
3. L. J. A. Brun.
7. J. H. Johnson.
71. R. J. Badge.
977. W. Spence.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned above.

Erratum. **Last Number, p. 611, col. 1, line 12 from bottom, *for* "centre of flotation," *read* "plane of flotation." The latter words were employed in the M.S. of the writer; how they came to be changed by the printer we cannot understand.**

CONTENTS OF THIS NUMBER.

LONDON: Printed and Published by Richard Archibald Brooman, of 166, Fleet-street, in the City of London; Sold by A. and W. Galignani, Rue Vivienne, Paris; Hodges and Smith, Dublin; W. C. Campbell and Co., Hamburgh.

Mechanics' Magazine.

No. 1822.] SATURDAY, JULY 10, 1858. [Price 3d.

Edited by R. A. Brooman and E. J. Reed, 166, Fleet-street, London, E.C.

COUSINS' PATENT STEAM PLOUGHS.

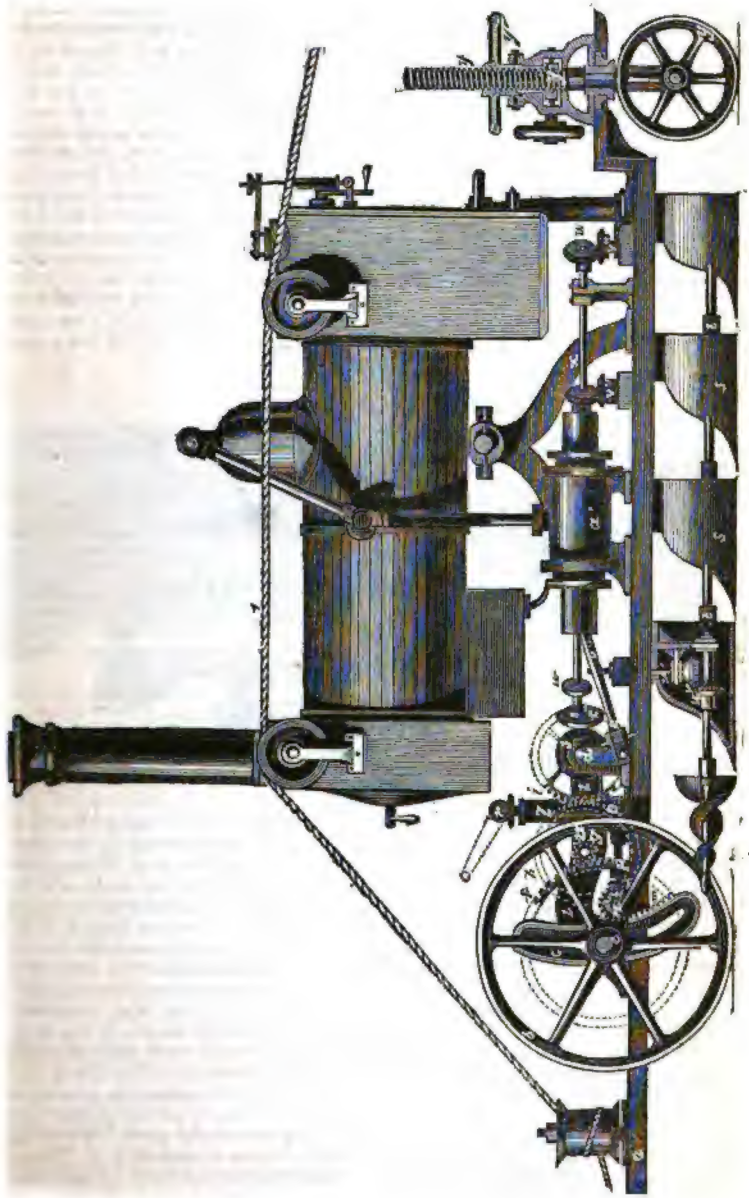


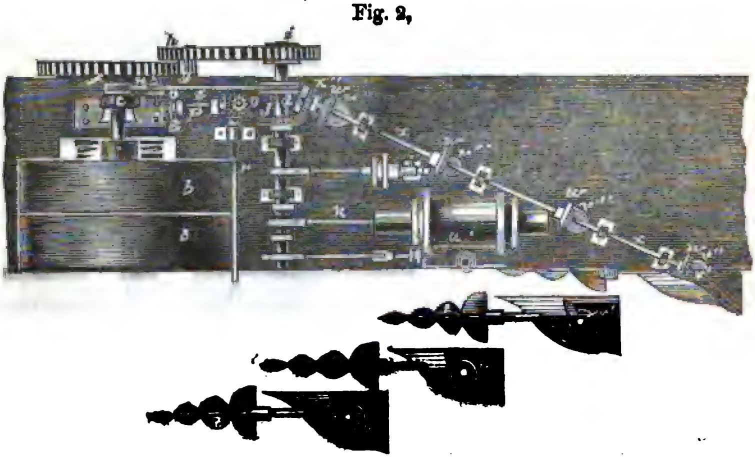
Fig. 1.

COUSINS' PATENT STEAM PLOUGHS.

Mr. J. J. Cousins, of Leeds, has patented a novel arrangement of steam plough. He uses any suitable kind of engine, which he mounts, with the boiler, on a horizontal frame supported by running wheels, capable of adjustment vertically like the wheels of ordinary ploughs. This horizontal frame carries a series of ploughshares and mouldboards, which are mounted parallel to each other, but are arranged in two diagonal lines extending from the front corners of the frame and meeting in or near the centre, so as to ensure their entering the ground in succession and operating upon the whole breadth of the stetch. Supposing the lead of one set to be to the right, the last plough to the left is arranged so as to turn over the earth in the reverse direction to the others, and *vice versâ* with the other set. In advance of each share an Archimedean screw is set for the purpose of loosening the earth before the share enters it, and also to assist in propelling the plough frame. The power of the steam engines is communicated to the running wheels of the plough frame, and also to the Archimedean screws, through bands, chains, or other driving gear. When the plough is desired to be set in motion, the forward end of the frame is lowered down the stalks of the plough wheels, so that the leading screws when set in motion may dip and burrow into the earth, and, when the desired depth is reached, the frame is to be adjusted to that level. The ploughing then proceeds steadily until the end of the field is reached, when the plough is to be turned round by means of a suitable steering apparatus, and the ploughing may then be resumed as before.

In the accompanying engravings is shown a mode of carrying the invention into effect. Fig. 1 is a side elevation of the apparatus complete; fig. 2 is a partial plan view, some of the parts being shown in section. *a, a,* is the framework, upon which the boiler and en-

Fig. 2.



gine and some of the other parts are mounted; *b, b,* are the running wheels, which are made with a broad bearing surface, so as to prevent them from sinking into soft ground. These wheels are connected with the framework, *a,* by means of the crane arms, *c, c,* which turn on the crank shaft, *d,* which is also the main driving shaft of the machine. The crane arms, *c, c,* at the other ends receive the axles, *e,* of the running wheels, which are placed inside the framing. These axles carry on their outer ends a large toothed wheel, *f,* into which gears a pinion, *g,* on the axle of another toothed wheel, *h,* that is actuated by a similar wheel, *i,* on the crank or main driving shaft, *d,* which is driven by the connecting rod, *k,* of the engine. The axle, *e,* of the running wheels passes through a curved slot in the slotted stalk, *l,* which is provided on its back with a toothed rack, *m.* A pinion, *n,* is made to take into this rack, and is driven by means of the bevil gearing, *o, o,* on the short shaft, *p.* This shaft is actuated by similar bevil toothed gearing on the short vertical end shaft, *q,* and the motion is transmitted to the other side of the machine by means of the transverse shaft, *r,* so that both the slotted stalks may be acted on simultaneously where it is desired to raise or lower the framework for the purpose of lifting up or lowering the cultivators, or removing them from out of the earth. The ploughshares and mouldboards are seen at *s, s,* and the Archimedean screws at *t, t.* The screws are mounted on horizontal shafts which pass through the inclined faces of the mouldboards, *s, s,* and carry on their inner ends inside the mouldboard a bevil toothed wheel, *u,* which is driven by a similar bevil wheel, *v,* on the lower end of the upright shaft, *v′,* which

passes up through the platform of the framing, and carries at its upper end another bevil wheel, v'', that gears into and is driven by a similar wheel, w, on the diagonal shaft, x. It will be seen that this shaft is driven by a bevil wheel, j, on the crank shaft, d, being made to gear into and drive a similar bevil toothed wheel, x, on the end of the diagonal shaft, and by means of the bevil gear, u, v, v'', w, all the Archimedean screws, t, t, are set in motion, and, when allowed to penetrate the ground by lowering the frame, these screws will take such a hold on the land as will on some soils be sufficient to draw the whole apparatus forward. The apparatus is supported behind by a steering wheel, y, the stalk, y', of which passes through a screw bearing, y'', whereby it may be adjusted to any height. The stalk of the steering wheel, y, is mounted in a swivel frame, which is provided with a sector rack or screw wheel, and endless screw to work the same, so as to admit of the steering wheel being turned round in either direction and to any desired extent. When it is required to turn the machine round, as at the headlands, it will be necessary to raise up the Archimedean screws, t, t, and the ploughshares and mouldboards, a, and to ungear the front running wheels, b, b, so as to admit of them turning freely in either direction. This ungearing of the wheels is effected by means of a clutch, z, which is worked by means of a screw and handles. The hinder end of the frame may be dragged round, so as to make the screws, t, t, point in the opposite direction, when the ploughing operation may be resumed as before. If desired, a guide rope may be adapted to the machine, and passed over or around pulleys provided for the purpose.

SINGULAR FORMS OF ANIMAL LIFE.

Among the unexpected revelations which the modern improved microscope has made to the scientific investigator, there is, perhaps, none more fertile in interest than that which relates to the very lowest type of animal existence; from the study of which both the Physiologist and the Zoologist may draw the most instructive lessons, whilst the Geologist finds in it the key to the existence of various stratified deposits of no mean importance both in extent and thickness.

Dr. Carpenter, F.R.S., recently drew the attention of the members of the Royal Institution to this subject, in an able paper now before us. As great and small are merely relative terms, it may be questioned whether the marvel of a complex structure comprised within the narrowest space we can conceive is really so great as that of finding those operations of life which we are accustomed to see carried on by an elaborate apparatus performed without any instruments whatever; a little particle of apparently homogeneous jelly changing itself into a greater variety of forms than the fabled Proteus, laying hold of its food without members, swallowing it without a mouth, digesting it without a stomach, appropriating its nutritious material without absorbent vessels or a circulating system, moving from place to place without muscles, feeling (if it has any power to do so) without nerves, multiplying itself without eggs, and not only this, but in many instances forming shelly coverings of a symmetry and completeness not surpassed by those of any testaceous animals.

As an example of this type of existence, the *Amœba*, a common inhabitant of fresh waters, may be first selected. This may be described as a minute mass of "sarcode," presenting scarcely any evidence of organisation, even of the simplest kind; for, although its superficial layer has a somewhat firmer consistency than the semi-fluid interior, this differentiation does not proceed to the extent of constituting even a body so simple as the "cell" of physiologists, which consists of a definite membrane investing and limiting its contents. Although at some times shapeless and inert, the Amœba at others is a creature of no inconsiderable activity. Its gelatinous body extends itself into one or more finger-like prolongations; the interior substance transfers itself into one or other of these, distending it until the entire mass is (as it were) carried into it; and then, after a short time, another prolongation is put forth, either in the same or in some different direction, and, the body being again absorbed into it, the place of the animal is again changed. When the creature, in the course of its progress, meets with a particle capable of affording it nutriment, its gelatinous body spreads itself over or around this, so as to envelope it completely; and the particle (sometimes animal, sometimes vegetable) thus taken into this extemporised stomach undergoes a sort of digestion there, the nutrient material being extracted, and any indigestible part making its way to the surface, and being finally (as it were) squeezed out. The Amœba multiplies itself by self-division; and portions separated from the jelly-like mass, either by cutting or tearing, can develope themselves into independent beings.

Nearly allied to this is another curious

organism, on which the attention of many eminent microscopists has been recently fixed. This creature, the *Actinophrys*, has a body whose form is more constantly spherical, but extends its sarcode into radiating filaments of extreme delicacy, which are termed *pseudopodia;* and it is by the agency of these, rather than by the change of place of its whole body (as in Amœba), that it obtains its food. For, when any small free-moving animalcule or active spore of a vegetable comes into contact with one of the pseudopodia, this usually retains it by adhesion, and forthwith begins to retract itself; as it shortens, the surrounding filaments also apply themselves to the captive particle, bending their points together so as gradually to enclose it, and themselves retracting until the prey is brought close to the surface of the body. The threads of "sarcode" of which the pseudopodia are composed, not being invested (any more than the sarcode of the body) by any limiting membrane, coalesce with each other and with it; and thus the particle which has been entrapped becomes actually embedded in the gelatinous mass, and gradually passes towards the central part of it, where its digestible portion undergoes solution, the superficial part of the body with its pseudopodial prolongations in the meantime recovering its previous condition. Any indigestible portion finds its way to the surface of the body, and is extruded from it by a process exactly the converse of that by which it was drawn in.

If it be inquired what are the characters by which these beings are distinguished from vegetable organisms of equal simplicity, a positive and satisfactory distinction lies in the nature of their aliment and in the method of its introduction. For, whilst the *protophyte* obtains its nutrition from the air and moisture that surround it, and possesses the power of detaching oxygen, hydrogen, carbon, and nitrogen from their binary compounds, and uniting them into organic compounds, the simplest *protozoon*, in common with the highest animals, seems utterly destitute of such power, and depends for its support upon organic substances elaborated by other living beings. Further, whilst the protophyte obtains its nutriment by simple imbibition, the protozoon extemporizes, as it were, a stomach for itself in the substance of its body, into which it ingests the solid particles that constitute its food, and within which it subjects them to a regular process of digestion.

There are found, in both fresh and salt waters, numerous examples of this Rhizopod type, which do not present any essentian advance upon the Amœba and Actinophrys; and a large proportion of these are endowed with a shelly investment which may be either calcareous or siliceous—the former being the characteristic of the *Foraminifera*, the latter of the *Polycystina*. In some of these testaceous forms, the pseudopodia are put forth only from the mouth of the shell, whilst in other cases this is perforated with minute apertures for their passage; but where there are no apertures the sarcode body not unfrequently extends itself over the entire external surface of the shell, and may give off pseudopodia in every direction. Generally speaking, the Foraminifera live attached to sea-weeds, zoophytes, &c.; but their pseudopodia have a very extensive range, and form a sort of animated spider's web, most wonderfully adapted for the prehension of food. The absence of any membranous investment to these threads is clearly indicated by their fusion or coalescence when two or more happen to come into contact; and sometimes a fresh expansion of sarcode takes place at spots remote from the body, so as to form new centres from which a fresh radiation of pseudopodia proceeds.

By far the greater number of Foraminifera are *composite* fabrics, evolved, like zoophytes, by a process of continuous gemmation, each *gemma* or bud remaining in connection with that from which it was put forth; and according to the plan on which this gemmation takes place will be the configuration of the composite body thereby produced.

Traces, more or less abundant, of the existence of Foraminifera are to be found in calcareous rocks of nearly all geological periods; but it is towards the end of the secondary and at the beginning of the tertiary period that the development of this group seems to have attained its maximum. Although there can be no reasonable doubt that the formation of chalk is partly due to the disintegration of corals and larger shells, yet it cannot be questioned that in many localities a very large proportion of its mass has been formed by the slow accumulation of foraminiferous shells, sometimes preserved entire, sometimes fragmentary, and sometimes almost entirely disintegrated. The most extraordinary manifestation of this type of life, however, presents itself in the "nummulitic limestone," which may be traced from the region of the Pyrenees, through that of the Alps and Apennines, into Asia Minor, and again through Northern Africa and Egypt, into Arabia, Persia, and Northern India, and thence (it is believed) through Thibet and China, to the Pacific, covering very extensive areas, and attaining a thickness in some places of many thousand feet; another extensive tract of this nummulitic

limestone is found in the United States. A similar formation, of less extent but of great importance, occurs in the Paris Basin; and it is not a little remarkable that the fine-grained and easily-worked limestone which affords such an excellent material for the decorated buildings of the French metropolis is entirely formed of an accumulation of minute foraminiferous shells. Even in the nummulitic limestone, the matrix in which the nummulites are imbedded is itself composed of minute Foraminifera and of the comminuted fragments of larger ones. The remarkable discovery has been recently made by Prof. Ehrenberg, that the green and ferruginous sands which present themselves in various stratified deposits, from the Silurian to the Tertiary epoch, but which are especially abundant in the Cretaceous period, are chiefly composed of *casts* of the interior of minute shells of Foraminifera and Mollusca, the shells themselves having entirely disappeared. The material of these casts, which is chiefly silex, coloured by silicate of iron, has not merely filled the chambers and their communicating passages, but has also penetrated, even to its minutest ramifications, that system of interseptal canals whose existence, first discovered by Dr. C. in Nummulites, has been detected also in many recent Foraminifera allied to these in general plan of structure. And it is a very interesting pendant to this discovery, that a like process has been shown by Prof. Bailey to be at present going on over various parts of the sea bottom of the Gulf of Mexico and the Gulf Stream; casts of Foraminifera in green sand being brought up in soundings with living specimens of the same types.

THE DRINKING WATERS OF THE METROPOLIS.

BY EDWIN LANKESTER, M.D., F.R.S., M.R.I.*

The water used in London for drinking purposes is obtained from both rivers and springs. The Thames and the New River, and partially other rivers, supply the river water. The spring water is of two kinds. First, from surface wells, obtained by digging through the gravel which covers the London clay in the western parts of the metropolis, and into the clay itself. Secondly, from deep wells, which generally pass through the London clay and penetrate the chalk below. The surface wells receive the soakage of the water which falls over London, and the water is contaminated by the contents of cesspools, drains, and sewers. The deep wells receive their supply of water from the chalk which forms the sides of the great "London Basin." All these waters contain more or less of the following mineral constituents:—

1. *Carbonate of Lime*, of which 3 to 17 grains are contained in the gallon. The carbonate of lime is the most common source of the *hardness* of the waters of London. It may be got rid of by Clark's process, which consists in adding lime to the water. This process would greatly improve the Thames water. This plan is carried out most successfully on a large scale at Plumstead. It was recommended by the Government Commissioners, on account of its "health, comfort, and economy."

2. *Sulphate of Lime*, in the proportion of from 1 to 15 grains in the gallon. It decomposes in contact with organic matters, and produces sulphuretted hydrogen. Very small quantities of organic matter serve to produce this effect.

3. *Chloride of Sodium* exists in Thames water, from 1 to 4 grains in the gallon; in deep wells, from 10 to 17 grains; and in surface wells, from 20 to 40 grains. In the Thames it may be the produce of the tide; in the deep wells it is washed out of the chalk; but in the surface wells, where it is most abundant, it is derived from the animal and vegetable refuse of the houses through which it percolates. The analyses of above one hundred of these wells showed that they were all equally open to suspicion on this point.

4. *Phosphates and Silica* exist in all the London waters in small quantities.

5. *Ammonia* also has been detected in small quantities in the Thames; in much larger and more appreciable quantities in the surface wells. This substance is the result of the decomposition of animal matter, and in the surface wells is undoubtedly derived from human excretions.

6. *Nitrates* result from the oxidation of the ammonia. They are absent in deep wells, exist only in very small quantities in the Thames, but in large and sometimes even dangerous quantities in surface wells. In one water, examined by Mr. Noad, above 50 grains in the gallon were detected.

The *organic* matters are not injurious when fresh or recent, but they assume certain conditions of decomposition which occasionally render them deadly. Their influence may be estimated by the case of the Lambeth and Vauxhall Water Company's supply, during the years 1848 and 1854,—two years in which cholera visited London. In 1848, both companies derived their supply of water from the Thames at Battersea, and both supplied the same dis-

* Abridged from a paper read at the Royal Institution.

trict with water, and the houses supplied were equally visited with cholera.

But in 1854 the Lambeth Company obtained an improved supply high up the Thames, at Ditton. The consequence was, according to Dr. Snow's calculations, that the deaths amongst the population supplied by the Vauxhall Company, as compared with the Lambeth, was as 7 to 1; according to the most favourable view of the case, as given by Mr. Swain, it was 3½ to 1. There is nothing to account for this difference but the larger quantity of organic impurity in the water supplied by the Vauxhall Company, which still obtains water from the more impure source. The outbreak of cholera in the Golden-square district in September, 1854, was traced to the pump in Broad-street, which was subsequently found to have communicated with the drain of a neighbouring house.

It appears, also, that water containing organic matter acts on lead, and thus adds another source of poisoning to its own. This had been pointed out by Mr. Noad and Dr. Medlock. Organic matters in standing water undergo a kind of fermentation, by which carbonic acid, sulphuretted hydrogen, and other gases are got rid of, and nitric acid is formed. The water thus undergoes a process of self-purification. This occurred in Thames water, and accounts for the fact that ships were often supplied with water from the Thames below London Bridge. This water is dangerous to drink before or during the fermenting process.

The appreciation of small quantities of organic matters by chemical processes is a difficult process. During the evaporation of water, the organic matters are dissipated, and not all left in the evaporating basin.

The microscope is an important aid. It detects the nature of organic impurities. These consist of *dead* and *living* animal and vegetable matters. The dead consist of the tissues of animals and plants. The source of these impurities can in some instances be made manifest. Such impurities are very manifest in the Thames and surface-well waters, scarcely to be detected in the deep-well waters. The living matters consist of plants and animals. The filaments of microscopic *Fungi* have been found in impure well water. They have been detected in several waters known to have been productive of disease. The lecturer had recorded two instances (*Quarterly Journal of Microscopical Science*, vol. iv., p. 270), and others had been published.

Amongst the living animals, the forms of *Infusoria* are most abundant. These are frequently indicative of the impure condition of water. Eggs of the higher animals are not unfrequently found in the Thames water; and some of these undoubtedly belong to those forms of *Annulosa* which find their highest development in the human body.

Many of these forms of animal and vegetable life are not injurious in themselves; but they are most numerous where there is the greatest amount of impurity, and are a measure of the greater or less objectionable nature of a water for drinking purposes. They are not present in water freshly drawn from deep wells.

From these circumstances it is concluded that the water from deep wells is most desirable and unobjectionable as drinking water; *that the water from surface wells ought under no circumstances to be drunk at all*; and that, if Thames water is used, it ought to be filtered, or, what is better, *boiled and filtered*. Boiling expels the carbonic acid from water, and renders it vapid; but its briskness may be restored by passing it through the gazogene. In the filtration of water various agents may be used, as sand, sponge, charcoal, rock, &c. The most effectual is animal charcoal, which may be introduced into any of the ordinary forms of filter. Dr. Medlock has shown that the addition of iron to water containing organic impurities precipitates them without rendering the water metallic. Water which had been filtered in contact with iron twelve months since is still quite pure, while water which has not been thus filtered shows a large quantity of impure vegetable growth.

THE TREATMENT AND USE OF SEWAGE:

BEING A PROPOSED METHOD OF DEODORISING SEWAGE AND CONVERTING THE USEFUL PART OF IT INTO A PORTABLE AND COMMERCIAL FORM WITHOUT IN THE SLIGHTEST DEGREE DETRACTING FROM ITS FERTILIZING PROPERTIES.

BY MR. H. WRIGHT.

In 1848-9 I was led to try a number of experiments on the effect of *burnt clay* on different kinds of sewage, and the results proved that this substance had the property of depriving the sewage most effectually of all its nitrogenous constituents, and forming a manure of the greatest practical efficiency. I found also, by experiment, that the solid product when kept exposed to the varying changes of the atmosphere did not give out obnoxious odours.

What I propose is, that this reagent should be used in connection with fine charcoal and gypsum, for the purpose of manufacturing solid manure from the sew-

age of towns. The reasons why I propose the addition of charcoal and gypsum are, 1st, by charcoal, to *insure* the complete absorption of all obnoxious gases; and, 2ndly, by gypsum, to fix the ammoniacal products that may be formed by the further decomposition of nitrogenous compounds after the solid manure has been obtained.

The proportions of the above reagents that would be required are, for every 100 tons of the available solid matter contained in sewage, 25 tons of burnt clay, 2½ tons of charcoal, and 1 ton of gypsum. After being reduced to a moderately fine state of division, these reagents are to be thoroughly mixed, by mechanical means, with the liquid sewage, and the whole allowed to run into reservoirs for subsidence.

By these means the sewage will be found to be completely deodorized, and will subside in equal admixture with the burnt clay and gypsum, whilst the greater part of the charcoal will be found to float on the surface of the reservoir, and form a protective stratum to arrest the escape of any deleterious gases which may have escaped absorption, or which might be formed from any accidental cause. In addition to the absorptive properties of the burnt clay, I also found that the solutions containing large quantities of viscous matter in suspension were cleared in a remarkably short time; in other words, in subsiding, burnt clay takes down with it the whole of the foreign bodies in mechanical admixture. After subsidence, the supernatant liquid is to be let off by the outlet specially provided, and means are to be taken to prevent the charcoal running to waste. The reservoir is then ready to receive another charge of sewage, and this process may be repeated until the stratum of solid manure has become sufficiently thick to necessitate its removal.

Cost of the reagents.—The cost of getting and burning the clay is somewhat dependent on the locality, but if the clay is found in the neighbourhood the cost would be in the ratio of 3*s.* per ton, the charcoal £3 per ton, and the gypsum £3 per ton. Thus, for every 100 tons of available solid matter in sewage,

			£	s.	d.
25	tons of burnt clay,	at 3*s*	3	15	0
2½	„ charcoal,	at £3	7	10	0
1	„ gypsum,	at £3	3	0	0
			£14	5	0

would be required, and £14 5*s.* the cost for reagents on every 128½ tons of the manure manufactured. Assuming the value of such manure to be £2 per ton, this gives the value of the product as equal to £257, from which deduct the above £14 5*s.* and the interest on cost of the machinery required, working expenses, &c., &c., to show the profit.

Method of applying the reagents.—The plan I propose, in order to effect this, is by means of revolving machinery, placed within the mouth of the sewer near the point of outfall into the reservoir; the admixture of the reagents to be added in constant equable proportions, through an orifice in the top, and by means of the revolving apparatus brought into intimate contact with every portion of the sewage This principle is in common practice in the brickyards in Kent, for thoroughly incorporating the clay and chalk, &c., previously to being pumped up into reservoirs for subsidence.

I find it stated in the public journals, that the quantity of liquid sewage produced daily in London is about 7,250,000 cubic feet; calculating 6 gallons to the cubic foot, this gives 43,500,000 gallons of liquid sewage. Professor Way, in his evidence on the water supply in 1850, states, that by analysis of two different specimens of sewage water he found in the first 492·26 grains, and in the second 209·70 grains of solid matter, part in a solid and part in an insoluble form. Now, from the experiments which I tried, I am enabled to state, that burnt clay will retain 373·42 grains from the former, and 159·18 grains from the latter; the average of these gives in round numbers 266 grains as the *available* solid product per gallon. Applying these figures to the number of gallons as stated above, we obtain in round numbers 670 tons of solid matter attainable from the sewage of London per diem, of which say 33 per cent. may be unavailable or wasted in various ways. This leaves us 450 tons which we may safely calculate as available. The cost of engine and machinery, with rollers for crushing and mixing the reagents, the revolving apparatus, &c., would not exceed £25,000. According to the proportion of reagents given above, 450 tons of available solid matter would require

			£	s.	d.
113	tons of burnt clay,	at 3*s.*	16	19	0
12	„ charcoal,	at £3	36	0	0
4½	„ gypsum,	at £3	13	10	0
			£66	9	0

We have thus, in round numbers, 580 tons of saleable manure per diem, or 211,700 per annum, at a cost for reagents of £66 9*s.* per diem, or £24,254 5*s.* per annum. Assuming the value of the ma-

nure at £2 per ton, as before, we have 580 tons at £2, equal to £1,160 per diem, or £423,400 per annum.

As confirmatory of the view I have here set forth, as to the efficiency of dried or burnt clay, I take the liberty of quoting the following passages from the "Preliminary Report of the Commission appointed to inquire into the best mode of Distributing the Sewage of Towns, and Applying it to Beneficial and Profitable Uses," presented to Parliament this year, pages 15 and 16. In describing the application of sewage, by irrigation, to the Edinburgh meadows, the Commissioners state, that

"The absorption of the offensive gases of sewage by the soil and by vegetation is so rapid that there is no perceptible smell five minutes after the application."

And, again,

"Upon examining the liquid which escaped from the banks on the seashore, after percolating through a *soil* little better than sand, it was found that this liquid was practically inoffensive, and might with propriety have been thrown into any ordinary watercourse."

"This practical illustration of the sufficiency of the *soil* to remove the offensive character of liquids which percolate it is quite in consonance with all the facts that have come under our observation, and we feel satisfied that wherever sewage can be so disposed of there is no fear of its reappearing in an objectionable condition."

HENRY WRIGHT.

11, Buckingham-street, Adelphi, W.C.
23rd June, 1858.

THE ATLANTIC CABLE.

The fears of Mr. Longridge and others have been realised. The *Niagara* and the *Gorgon* arrived at Queenstown, Cork, on the morning of the 5th.

Three attempts have been made to lay down the electric telegraph cable. The squadron experienced very bad weather during their cruise. On the 13th of June a heavy gale sprang up, during which they were separated, but all met again at the rendezvous, 52·2 lat., 33·18 long. On the first attempt about 10 miles of cable were lost, on the second about 120 miles, and on the 28th the cable was again joined, and about 250 miles were paid out, when, communication ceasing to be received, the cable was parted, and the *Niagara* and the *Gorgon* proceeded home. Much to their surprise, the *Agamemnon* and *Valorous* were not in before them, as they had more than two hundred miles start. The *Agamemnon* is reported to have suffered some damages in the gale.

Such is the summary given in the newspapers of the proceedings of the expedition. The fullest information which has come to our knowledge at the time we write is the following, which is condensed from the *Cork Reporter*, and was furnished to that paper, in all probability, by the officers (American) of the *Niagara*.

"After having been three days at sea the expedition was overtaken by a fearful gale, which continued without intermission *for nine days*. On the seventh day of this heavy weather the ships had to part company, and the *Agamemnon* was obliged to scud before the wind for thirty-six hours; her coals got adrift, and a coil of the cable shifted, so that her captain for some time entertained serious apprehensions for her safety; and from the immense strain her waterways were forced open, and one of her ports was broken. Two of her sailors were severely injured, and one of the marines lost his reason from fright. Yet such was the consummate skill, good seamanship, and intrepidity of her commander, that he was enabled to bring her to the appointed rendezvous, lat. 52° 2′, long. 33° 18′. The *Niagara* rode out the storm gallantly, having only carried away her jibboom and one wing of the figure-head, the great American eagle. All the vessels having at length arrived at their central point of junction, the first splice of the cable was made on the 26th. After having paid out two and a-half miles each, owing to an accident on board the *Niagara*, the cable parted. The ships having again met, the splice was made good, and they commenced to give out the cable a second time; but after they had each paid out forty miles it was reported that the current was broken, and no communication could be made between the ships. Unfortunately, in this instance the breakage must have occurred at the bottom, as the electricians, from the fine calculations which their sensitive instruments allow them to make, were able to declare such to have been the fact, even before the vessels came together again. Having cast off this loss, they met for the third time and completed the connexion of the cable on the 28th. They then started afresh, and, the *Niagara* having paid out over 150 miles of cable, all on board entertained the most sanguine anticipations of success, when the fatal announcement was made on Tuesday, the 29th, at 9 p.m., that the electric current had ceased to flow. As the necessity of abandoning the project for the present was now only too manifest, it was considered that the opportunity might as well be availed of to test the strength of the cable. Accordingly, this immense vessel, with all her stores, &c., was allowed to

swing to the cable, and, in addition, a strain of four tons was placed upon the breaks; yet, although it was blowing fresh at the time, the cable held her as if she had been at anchor for over an hour, when a heavy pitch of the sea snapped the rope, and the *Niagara* bore away for Cork. Before starting an arrangement was made that, should any accident occur in giving out the cable before the ships should have gone 100 miles, they should return to their starting place in mid-ocean; but that, in case that distance should have been exceeded before any casualty should happen, they should make for Queenstown. In accordance with this understanding, the *Niagara*, having made 109 miles before the mishap, returned to this port. Upon her homeward way she must have passed the *Agamemnon*, but, owing to the heavy fogs which prevailed for the greater portion of that time, she missed seeing or gaining any tidings of her. As the *Agamemnon* has not yet arrived, although her destination was directed towards this shore, it is conjectured that she might not have delivered the arranged quantity of coil at the time of its failure, and may have consequently returned to their place of meeting, which will unavoidably protract the suspense which must necessarily be felt, as, until she be spoken with, nothing definite can be learned as to the occasion of this disaster. The two principal electricians, Dr. Santy and Mr. Lawes, on board the *Niagara*, are inclined to believe that the accident occurred on board the *Agamemnon*, which, as it would only implicate a faulty arrangement of some of the apparatus, would still leave hope of the ultimate success of the undertaking; whereas, if the separation has occurred at the bottom, its effects will be greatly to damp, if not deter, the spirit of the directors from persevering in this gigantic project. Should nothing be heard of her consort the *Niagara* will, after coaling, proceed to her ocean station, having still on board about 1,300 miles of the cable, which, supposing that the other vessel has retained a similar amount, would still permit of the junction being completed, and allow 30 per cent. for casualties. In this last trial some 500 miles of the rope was lost, and it is roughly estimated that the value of the cable is about £100 a mile."

The *Times* has published an article recommending the employment of the *Leviathan* for the laying of the cable, stating that "the pitch of that huge vessel will be quite inconsiderable in the roughest seas, and the strain on the cable will therefore be uniform." This is a great mistake. There may be good reasons for employing the *Leviathan* for the purpose; but it is well known that there are at sea occasional waves or rollers which greatly exceed in size the ordinary undulations, and Professor Piazzi Smyth, from observations made on his late voyage to Teneriffe, deduced the fact that, however large a ship may be, these large exceptional undulations would be certain to cause her to pitch considerably, and a very little tendency to pitch in the *Leviathan* would be fatal to any stretched rope.

Let a light rope, which will cost but little, be now tried, if the Atlantic cable project is to be again attempted, and there is no good reason why it should not. Efforts will doubtless be made to show that there is no chance for a light rope—indications of such efforts having, indeed, already appeared; but it is by resorting to it alone that we shall gain a prospect of success.

THE PURIFICATION OF THE THAMES.

[We have received the following letter from Mr. Macintosh, several of whose inventions are well known, and whose great war invention, in particular, was interdicted by Lord Panmure, on the ground of its too great efficacy. The Thames can hardly, we presume, be dealt with too effectually.]

GENTLEMEN,—The large circulation of your Magazine among military, civil, and mechanical engineers will enable you to do much permanent good by your publishing the following practical means for preventing an enormous quantity of valuable manure and offensive sewage being discharged into the Thames.

I have been led during the last fortnight to investigate the various plans proposed to the Select Committee appointed by the House of Commons to inquire into the present state of the river Thames, having, eight years ago, endeavoured to bring the following into practical operation, which consists of attaching to every sewer, ditch, drain, or watercourse emptying into the Thames large canvas cylinders or catch-bags, each having a neck which is easily fixed to the mouth of the sewer or outlet until it is filled. It is then closed, and another is attached, so that each sewer or outlet is provided with a number of cylinders, varying according to the quantity of sewage discharged. When full, they are connected together and floated down the river by the tide, kept in their proper course by the aid of a steamer, and discharged at any suitable spot, either deodorised or thrown on the land as manure, returning by the tide and steamer in a collapsed state

to be refilled; or the bags may be used as filters, detaining the heavy portions of the sewage. From the flexible nature of the cylinders they are not liable to be damaged by vessels, nor can they cause any obstruc-to the navigation of the river, as they float with a small portion only above the surface. This could be put in operation in a few days and at a trifling expense.

Or, the sewage may be conveyed from the mouths of the sewers through pipes leading to a large metallic sewer, laid flush with the bottom in the centre of the river, and extending to Sea Reach or other convenient place. We have many old-fashioned hulks, substantial but not useful as line-of-battle ships, frigates, or brigs, which I propose to use as reservoirs to intercept the sewage, by closing their ports, hatchways, &c., caulking and paying them well over with pitch or other suitable air and water proof substance, connecting them with the main sewer, and sinking them low enough to allow the sewage to flow into the reservoirs at all states of the tide, discharging the sewage seaward at the turn of high tide, so as to prevent it from being brought back within four or five miles of the point of discharge, as the tide flows five hours and ebbs seven. Or, connecting the vessels forming reservoirs close to the sewers, and sinking them a sufficient depth to allow sewage to flow into them at all states of the tide by gravitation; combining the two principles of filtration and precipitation, and dispensing with the sewer in the centre of the river; the reservoirs or vessels being strong and air-tight, a steam engine or other motive power may be used to cause a partial vacuum of five or six pounds to the inch, which would cause a rapid flow of sewage through the pipes, preventing all possibility of deposit, and allowing the sewage freely to rise in the reservoir to a height due to the rarefaction of the atmosphere. The heavy portion of the sewage that settles at the bottom of the reservoir, and which is most valuable as manure, can be easily forced through a pipe leading out of the reservoir, and discharged by simply compressing instead of rarefying the air.

Thus, the whole operation of filtration, precipitation, or deodorisation, can be practically carried out on a sufficient scale to bring the Thames back to its original purity, without the escape of noxious vapours. The cost of the catch-bags or cylinders would be £4,000, and they could be finished and put in operation in ten days from the date of order. The attaching hulks to the sewers would cost £12,000, and be completed in two months. The cost of conveying the sewage from Hammersmith to Barking Reach would be £500,000, assuming that the Government would find the hulks, and could be completed in three months; if continued to Sea Reach, the cost would be £900,000, and this would be completed in five months.

I have ventured to suggest these modes of meeting the urgency of the case as not only most practical but also avoiding expense and delay.

I am, Gentlemen, yours, &c.,
J. Macintosh.

[If a number of useless ships should be required for the purposes proposed by Mr. Macintosh, we could readily refer him to some scores now lying in our various harbours which will never again be used for naval objects, and which would only afford dangerous materials for combustion should any misguided emperor make a descent upon our coasts, and fire our shipping by the aid of Mr. Macintosh's incendiary shells, which Lord Panmure permitted to be given to the world.—Eds. M. M.]

THE SUPERANNUATION OF CIVIL SERVANTS.

In the Parliament of 1857, one great cause of the civil servants' complaints was swept away by the passing of Lord Naas' Act, which put an end to all deductions from salaries on account of superannuation allowances. The remaining cause of complaint—that of the anomalous discrepancies which exist between the allowances granted to clerks and those granted to other officers —is about to be done away with by a Bill which Mr. Disraeli, as Chancellor of the Exchequer, introduced into the House of Commons on Thursday, the 1st inst., and which has passed through its early stages. This Bill brings all classes of officers for the future into one category, and provides that the superannuation allowance to be granted after the commencement of the Act to persons who shall have served in the Civil Service of the State, and for whom provision shall not otherwise have been made by Act of Parliament, Order in Council, or Royal Warrant, or who may not be specailly excepted by authority of Parliament or by Minute of the Commissioners of the Treasury, shall be as follows:—

To any person who shall have served ten years and upwards, and under eleven years, an allowance of 10-60ths of the annual "salary and emoluments" of his office;

For eleven years, and under twelve years, an annual allowance of 11-60ths of such salary and emoluments;

And, in like manner, a further addition to the annual allowance of 1-60th in re-

spect of each additional year of such service, until the completion of a period of service of forty years, when the annual allowance of 40-60ths may be granted; and no addition shall be made in respect of any service beyond forty years.

One clause of the Act further provides, that it shall be lawful for the Commissioners of the Treasury to increase the preceding allowances in cases of special merit, and to diminish them in cases of special demerit.

Another clause renders it unlawful to grant any superannuation allowance to a person under sixty years of age, except in cases of premature infirmity of body or mind; and, should any person succeed in obtaining such an allowance upon a medical certificate, he will be liable to be again called upon to serve should his health permit. All civil servants are further to be compelled to retire at the age of sixty-five, except their services should, in special cases, be required.

Nothing contained in the new Act shall "prevent, restrict, or diminish any pension, superannuation allowance, gratuity, or compensation," which, if this Act had not been passed, might hereafter be granted to any person who shall have entered the service before a certain day (which is left blank in the Act). No superannuation or other allowance shall be subject to any deduction beside the tax on property or income.

Lord Derby's Government, in framing the Bill, the principal provisions of which we have above sketched, have followed the recommendations of the Royal Commissioners who closed their sittings in 1857; and the measure will no doubt give general satisfaction. It will militate against the interests of the clerks to a certain extent; but these gentlemen have had matters their own way too long. It affords us sincere pleasure to find that the mechanical officers of the Royal Dockyards and others have at length had their just claims listened to and satisfied. But, after a careful perusal of the present and former Acts, and of the reports of the Committee of the House of Commons and the Royal Commission, we are left in doubt whether working men and inferior officers are to participate in the benefits of the new Bill.

STEEL SHIPS.

In December, 1850, Mr. Ewald Riepe obtained an English patent for certain improvements in refining steel, which were described in No. 1453 of this Magazine, p. 476. They consisted mainly in subjecting bars or lumps of raw or crude steel to the action of heat for about four hours in a furnace closed to the external atmosphere, the temperature being kept a little below the melting point of the steel. By this method of operation, carburetted hydrogen and oxide of carbon are developed in the furnace in abundance, while the oxygen of the air is entirely prevented from acting upon the steel, the working door of the furnace, &c., being carefully luted for this purpose.

This patent, which was permitted to remain in abeyance for some time, has lately been worked with very beneficial results by Mr. William Clay, of the Mersey Ironworks, the steel produced by means of it having been found to possess a very fine uniform grain, and to be peculiarly suitable for the plating of ships. A new steamer of 170 tons, named the *Rainbow*, intended for the Niger Expedition, has been constructed of plates of this steel at the building yard of Mr. J. Laird, of Birkenhead. She was tried on the Mersey on Saturday last, and is to sail for Africa this week. Her dimensions are:—Length, 130 feet; beam, 16 feet. The hull is subdivided, by athwartship and longitudinal bulkheads, into 10 or 12 watertight compartments, for giving her greater strength and rendering her more secure against accidents. Her engine is high-pressure and of 60 horse power, working up to 200 horse power, indicated; and the boilers, which have also been made of Mr. Clay's steel plates, have been proved up to 200lbs. on the square inch, though they will only require to be worked at 50lbs. to 60lbs. The engine and boiler, as well as the hull, have been constructed by Mr. Laird. The advantage of employing this material over the ordinary iron plates is that, with about half the thickness, they are said to give equal strength with the best iron boiler plates, so that vessels are able to be constructed of considerably lighter draught of water than formerly, a result which is likely to be of incalculable benefit in the navigation of the shallow rivers of Africa and India. It will be remembered that Dr. Livingstone took out a small steam yacht the plates for which were formed of the patent homogeneous metal, manufactured by Messrs. Shortridge, Howell, and Jessop, of Sheffield. The advantage claimed for the Riepe steel is that, while possessing equal strength and adaptability for the purposes of ship-building, it can be more economically produced. Indeed, it is said that the process of manufacture is so simple, and the cost so little in excess of that of ordinary iron, that, by the saving of weight in the material, as compared with iron of equal strength, it will become absolutely cheaper. *Apropos* of the strength of the

steel, we may state that recent experiments, made by Mr. Clay in testing, at the Liverpool Corporation chain-proving machine, some samples of steel bars manufactured at the Mersey Works, showed that their average tensile strength was 160,832 per square inch, while the strength of Russian iron is only 62,644; of English rolled iron, 56,532; Lowmoor, 56,103; American hammered, 53,918; of tempered cast steel, 150,000, &c.

NEW THEORY OF WINDS.

In the Hadleian theory of winds, which is now generally recognized, it is assumed that, when the tropical heat expands the gases, they rise and flow away laterally in the higher regions towards the poles, from which they return to the tropics in the lower regions. But it is now contended, in a paper sent to the Royal Society by T. Hopkins, Esq., that such heating of the gases merely expands them, without making them rise and overflow to other parts. The rise of heated air in a chimney, sometimes pointed at as an illustration, is shown to be not analogous to that which takes place when the sun heats the air unequally in different latitudes; if it were, cool air would flow from all parts around to the greatly heated locality, just as cool air passes to a fire, and, when heated, up a chimney. It is also shown that it is gravitation which establishes an equilibrium of pressure in the atmosphere, and that direct solar heating of the surface of the earth and the air near to it does not destroy that equilibrium. The solar heat merely raises the air that is near the surface, over the most heated latitudes, a little higher than the adjoining less heated; and, as there is no alteration produced in *the weight of any vertical column* of the atmosphere, in any latitude, there is neither overflow of air above nor disturbance of the equilibrium of pressure. The great disturbances that take place in the atmosphere are, it is maintained, caused by the heat which is conveyed from the surface of the globe in vapour to different parts of the atmosphere at various heights, and liberated in those parts when the vapour is condensed into liquid. This liberation of heat creates ascending currents in the parts locally affected, when horizontal winds, produced by gravitation, blow over the surface towards the ascending currents to re-establish the disturbed equilibrium. This process, by heating the air in the middle regions, is asserted to have been proved to be the cause, not only of the great trade-winds and the monsoons, but of the storms and local winds over the different regions of the globe.

STABILITY OF FLOATING BODIES.*

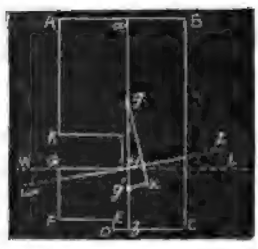
Gentlemen,—When you first permitted me to introduce this subject to the notice of your readers, my intention was merely to offer facts and suggestions to their notice, to abstain from dogmatizing and formulating, and to avoid controversy. I had reason to believe that some of your correspondents had more ability than myself to deal with the data I might purvey; and I am now of opinion that your correspondent "A Mechanic" possesses the requisite mental endowments and mathematical skill for the task. But, unfortunately, his communications indicate that the pressure of other matters upon his mind has prevented him from maturely considering the phenomena exhibited by floating bodies when their equilibrium has been disturbed, and the result is, that he has inadvertently fallen into mistakes.

In your Number for June 12th, page 563, he makes the following statement:

"Take a prism whose section is of the form represented in the figure, BC=24, AB=12, DE=1, FE=6, IH=3, GH=6. Specific gravity=¼. Such a prism would float in equilibrium when GH coincides with the water-line, but the distance between the centres of gravity and buoyancy would be neither a maximum nor a minimum. I do not know very well what to call such a position of equilibrium. *The body would upset on one side only.*"

Now, all questions of maxima and minima I, at present, refrain from noticing. I believe I shall be able anon to produce some useful facts with regard to that portion of the subject. At present I confine myself to the assertion that "*the body would upset on one side only.*"

To test this I had a prism accurately made of cork of the sectional form prescribed, its length about three times the



breadth (A B) of its base. Its specific gravity being about 1-24th too little, I increased it, taking care not to disturb the

* We desire that the discussion upon this subject may be brought to an end without receiving any further expansion than may be required by our correspondents to complete their respective views.—Eds. M. M.

normal centre of gravity. On placing this prism in the water and supporting it in the position required, the water-line of course became coincident with G H. But on the slightest deflection to the left it upset very suddenly, as might have been anticipated, and the slightest deflection *to the right was sufficient to make it upset on that side also.* Therefore the experiment conclusively proved that "A Mechanic" was in error.

Nor was I surprised at this result. A very few figures had enabled me previously to ascertain the precise positions of the "three centres," and that they were in the vertical line $a\ b$, while the body was in an upright position. This line $a\ b$ is at a distance from A F=6·2727, and from B C =5·7273. g is about the centre of gravity, g' may indicate the position of the centre of buoyancy, and the *metacentre* is not far from H. It will be obvious to "A Mechanic," that with the smallest angle of deflection g acquires moment; for its motion to the right as compared with the motion of g' is nearly as g H to H g'. And, with the deflection shown in the figure g' is required to be at x to prevent the motion of g from continuing. But, as this is impossible, motion proceeds till another position of equilibrium is arrived at.

I regret to find the same indubitable marks of haste in the last letter of "A Mechanic." He says, "I was thinking merely of the initial motion, and meant to say that, when the deflection of the body from the upright begins, there are many cases in which the motion of the centre of gravity has a vertical component, and does not commence wholly in the horizontal direction, as the supposition of your correspondent requires."

My opinion is, that this vertical component exists in *all* cases, and that gravity is its cause. The motion of the centre of gravity to which I referred is a resultant from the vertical force of gravity on the one hand and the statical law which prevents the centre of gravity from descending vertically (because in doing so it would increase the amount of displacement) on the other. The latter consideration, with varying immersed forms, is necessarily a very complex one.

It would be exceedingly irksome for me to reply *seriatim* to all the remarks "A Mechanic" has made. I should be grateful to him if he would apply his time and his attainments sedulously to the elucidation of the subject; and my gratitude would not be diminished by his exposure of erroneous conceptions on my part. I must, however, at present say that I am not yet under an obligation to him for the latter favour.

I imagine that we contemplate the subject from two different points of view. I suspect he makes the motion of the water the primary deflecting force. If so, the phenomenon, in my opinion, becomes unnecessarily complicated. I, on the contrary, assume the water to be quiescent, and the body to be deflected by some extraneous temporary force. I conceive when the body has its centre of gravity *above* the *metacentre*, but in the same vertical line, its position is that of unstable equilibrium; when it has its centre of gravity *below* the *metacentre*, but in the same vertical line, its position is that of stable equilibrium. When the body is in the former position, the smallest possible deflection causes the centre of gravity to depart from the line of support; and, gravity acting upon it, it consequently descends, till it gets into a position vertically below the metacentre; and this appears to me to be a semi-rotation round that point, motion being *caused* by *gravity*, and *modified* by the statical law which regulates the displacement.

A tumbler of water and a pin stuck in the cork of a wine-bottle will exhibit the *fact* to which I have adverted. If the cork be perfectly cylindrical, its *metacentre*, I have shown, must be in its centre of gravity M C. The pin at A raises the centre

of gravity above the *metacentre*, and the equilibrium is unstable. If put into the water with A uppermost, it instantly upsets, and A goes round (its movement varying with the apothem) to A A'', and till it arrives at A''''; every particle of the cork performs a like rotation round the metacentre, and the body ultimately settles in a position of stable equilibrium when A has arrived at A''''. Here, then, at all events, is *the fact;* and "A Mechanic" will perceive the want of cogency in his remarks upon "no horizontal force" and "the laws of nature," &c. It appears to me that there is a similitude in this to what the centre of gravity *attempts* to do in *all cases.*

In this instance the only cause of motion after the primary deflection is gravity. But, as the displacement is constant, and the metacentre unchanging, it appears to me to be idle to call the motion anything but a motion of the one round the other. There may be a lateral motion of translation affecting the whole body which "A Mechanic" may trace, and the laws of which I think he is competent to analyse, but this will not alter the fact for which I contend, any more than the motion of the earth in its orbit interferes with its axial rotation. The action of the water upon a varying immersed form changes the position of the *metacentre;* but the *principle* involved in the motion of the centre of gravity, as above illustrated, appears to me to be undeviating.

Several remarks made by "A Mechanic" are obviously indicative of misconception, and others rather of buoyant spirits than of profound thought. It is only necessary to remind him that in the case of my triangular prism, which shows that in some cases the centre of gravity descends and in others ascends during the transition from unstable to stable equilibrium, the ascent or descent of this centre is *absolute* and relative to the level of the surface of the water, and that, if the *metacentre* rises faster than the centre of gravity descends, *it may be ascending absolutely while it is descending with relation to the metacentre.* In fact, such *is* the case, and such phenomena must be familiar to "A Mechanic."

I hope captiousness will not be imputed to me for these remarks; if my views are worth criticism they are worth vindication.

NAUTICUS.*

WOOLWICH IRRESPONSIBLE REPORTS.

GENTLEMEN,—If I have been silent, I have not been inattentive to the contents of your valuable paper for the last six months, and I trust you will not consider my breaking that silence an intrusion in this instance. That there should be grounds for the strictures of "Observer" and others on the mal-administration of the War Department, is most irritating to an English tax-payer; the wanton waste of our money, and the utter recklessness as regards the safety of the country, compared with the inveterate taste for jobbery and favouritism, violate our principles of morality and patriotism. Talented men are deterred from submitting their unpatronized ideas when they reflect on the fate of Mr. Drake and other inventors, and the country consequently sustains a twofold loss.

The ostensible point of attack is, the "*irresponsibility*" of the Woolwich reports and the dependence of the War Department upon them. These are either the concoctions of incompetency, or result from covert directions whose only law is, *sit pro ratione voluntas.* The glaring instance of that complex monstrosity the American gun ("pop-gun"), said by Lord Panmure in the House to have been purchased in consequence of the Woolwich reports, offers a case in point. With Mr. Drake's gun before them, by some blind or crooked path they put the country to probably £30,000 expense for what any engineer would have pronounced worthless, and rejected what many have approved. The American gun appears to have been sunk in the waters of Lethe—there let it lie—but, alas! from all I can learn, the English plan, if unpatronised, must bear it ill-assorted company, although we hear through newspaper reports that the Americans have been bringing out similiarly constructed guns with four charged breech, and firing 30 rounds per minute, the breech remaining perfectly cool for continuing the practice; and the Americans assert 60 rounds attainable within the same time. I think the War Department bound to give the English invention a fair trial before re-importing it as a Yankee notion; and, now that changes are about to be made at Woolwich, it is imperative on General Peel, who assumes all responsibility, that a just and competent tribunal be established to discharge its duties faithfully to the State, and no longer reject the good and select the bad, purposely or otherwise.

I am, Gentlemen, yours, &c.,

G. W. JACKSON, C.E.

Great Western Hotel, 3rd July, 1858.

[The following extract from the Naval and Military Intelligence of the *Times* of Tuesday last may fitly be quoted after the letter of our correspondent:—"The galvanic battery usually employed at the proof butt in Woolwich Arsenal, having been readjusted and repaired, is again rendered available for the purpose of proving guns. A large number of 8 and 10 inch and 68 pounders received from the Lowmoor and other contractors are ordered to be fired at the rate of 15 per day. The first batch of 15 were fired yesterday, and stood the test well. Mr. Eastman's American breech-loading cannon, six in num-

* We have removed from the above letter a paragraph or two written in refutation of an error which arose from a misprint, and which was corrected in our last Number.—Eds. M. M.

ber, and which were purchased by Government upwards of twelve months ago, are still lying at the Arsenal Wharf untouched. Mr. Mallet's mammoth mortars, although purchased at an enormous cost, are, it appears, also considered to be equally valueless, as the second and smaller one remains in the spot on the Arsenal Wharf where it was first landed, and the first, repeatedly damaged and repaired, will not, it is said, be subjected to any further evidence of the inefficiency of the invention." —Eds. M. M.]

SHIP-BUILDING ABROAD.

Much has of late been said about the naval preparations of the French. The forward movement is not confined to that country; Russia is making great, though silent efforts to place her war marine not only in a state of present efficiency, but is providing for the future. In many of our great engineering and ship-building establishments she has placed intelligent young men, under agreements for given periods, and the payments of large premiums, for the purpose of acquiring both theoretical and practical knowledge. We are most of us aware of what the United States can do under the pressure of circumstances. Denmark, Sweden, and Spain are moving, but languidly; the first two are short of financial power, Spain is absorbed in the contemplation of her own self-importance. But it is in Holland, perhaps, that the greatest practical advance has been made and prepared for, position and financial means considered. In that country iron ship-building has been taken up with spirit, and seagoing vessels have been lately turned out which appear to be remarkable for their beauty of structure, and are the fastest afloat.

The lovers of general improvement will rejoice that such things can be done by a friendly neighbour, but our iron ship-builders will see in the fact strong reasons for increased exertion and skill. We must bear in mind, however, that much of this excellence is due to the London-made engines. I am not exactly informed of the speed of the *Prince Frederick William* mail steampacket; certainly it cannot be greater than, if so great as that of the Dutch-built passenger boats in a no very gentle or plain-sailing navigation.—*Nauticus, in the Times, July* 6.

DRYING WOOD.

Gentlemen,—In answer to your correspondent's letter of last week, I beg to offer the following as a good, although not a very quick method of doing what he requires:—

If the blocks of oak be new, I would advise him to soak them in water for four or five weeks (as by so doing all the sap in them will be extracted), and then expose them to the heat of the sun.

But, if they are old oak, he need only expose them to the heat of the sun, or, which will be as good, place them in some dry place where the wind can blow through them.

I am, Gentlemen, yours, &c.,
W. Ridley.

GUN-COTTON.

Gentlemen,—I have found, after many trials, that a gun-cotton cartridge fires *stronger* from a breech-loader than from a rifle loading at the muzzle. The reason is, that, firing from a breech-loader, the shot offers more *resistance* than when loading at the muzzle, consequently the *whole* of the gun-cotton is ignited; whereas, loading at the muzzle, the shot not offering so much resistance, a portion of the gun-cotton is blown out without being ignited.

I am, Gentlemen, yours, &c.,
J. Norton.

Rosherville, 5th July.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

Galloway, G. B. *Improvements in the construction of merchant ships and other vessels, in motive powers, propulsion, and boiler furnaces.* Dated Oct. 31, 1857. (No. 2766.)

Vessels are constructed with a series of flat hollow channels between the bulwark and the bends of the vessel. Cork is inserted in these tubes, through which the fastening to the vessel's timbers and planking is effected. When required, the patentee also inserts tubes between the timbers, and under the water-line of the vessel, and also at the bottom, the object being to produce buoyancy, together with means of preserving life in case of shipwreck. In boats, he affixes around the top sides air-tight channels, and, as a means of lowering them in cases of emergency, he affixes a sling with a leading block or thimble in the centre. Such sling is attached to each side, both fore and aft of the boat. A rope fastened to a cleat passes through the leading blocks, which are secured to the bottom of the boat, and also affixed to the ring bolts fore and aft, as the means by which the vessels are suspended and lowered. He also applies another tube within the boat, under the seats fore and aft, to remedy accidents, as it will prevent the boat remaining bottom up; and, to prevent sinking in case of being stove and made leaky, he affixes tubes below the bottom boards of the boat. In motive power and propulsion the engine used he denominates a "planet motion;" it is in form like a rotary engine, but his improvements consist in the internal arrangements being constructed similarly to a water wheel, upon the arms or buckets of which he directs the action of the air, water, or steam. The peculiarity of his propeller, which he denominates the "fish fin," consists in being broadest at the boss, which, in-

stead of being of great thickness, and thereby offering resistance to the vessel's progress, is made long, and in a direct line with the shaft. In boiler furnaces the boiler has additional fire-places, and over the fires thus produced the flame from the coal fires is caused to pass by a suitable arrangement of the flues or tubes. An air channel is formed across the front of the several fire-places, and into it air is forced. There are apertures therein with nozzles communicating with the fire door frames, and also the fire bars, which are hollow, and through which the air is forced, the object being to increase the draft of the fires, and prevent the waste of the fire bars, door frames, &c.

Lowe, T. *A new or improved method of feeding screws, blanks, shanks, pins, and other such like articles, to turning, nicking, and worming lathes or machines.* Dated Oct. 31, 1857. (No. 2768.)

This invention cannot be described without engravings.

Landfort, L. de. *An apparatus for protecting the contents of pockets of wearing apparel from theft and loss.* Dated Oct. 31, 1857. (No. 2770.)

This consists of an apparatus attached to the waistcoat, or other article, and encircling the pocket.

Schuessel, J. J., and P. J. Thourет. *The manufacture of a composition which will render inflammable materials incombustible.* Dated Oct. 31, 1857. (No. 2772.)

This consists in the application of a mixture of phosphate of ammonia with chloride of ammonia, and gum arabic diluted according to circumstances.

Kyishogloo, P. B. *Improvements in obtaining and applying motive power.* Dated Oct. 31, 1857. (No. 2775.)

The patentee employs a combination of air, hydraulic, and other engines and apparatuses, of a very complicated character, to produce a perpetual motion, or something very like it.

Fry, J. *An improvement in cementing fabrics when india rubber is employed.* Dated Oct. 31, 1857. (No. 2776.)

This consists in the use of gum and india rubber solutions in a peculiar manner, combining vulcanised india rubber with fabrics containing or composed of wool, silk, or animal fibre, which, if subjected to the ordinary process of heat for vulcanising india rubber, would be injured.

Cottam, G. H. and H. R. *Improvements in stable fittings.* Dated Oct. 31, 1857. (No. 2777.)

In constructing gutters, wrought iron is rolled to proper lengths and sizes, bent near the edges to produce ledges for the covers (when covers are used), and then rolled into the hollow or gutter form. If of malleable cast iron, they are first cast and then rendered malleable. If of ordinary cast iron, they are annealed to render them tough. In making covers for such gutters, the narrow plates are of wrought iron, and formed with one surface rough (to afford foot-hold to horses) and perforated. They are formed of malleable or cast iron by the methods just described in reference to the gutters. The patentees also similarly make partition posts of stalls and stable boxes of wrought iron, hollow on the inside, and with feet and heads to be fixed in the ground by concrete. The capping or ramps and sills are likewise made by the methods described. Metal brackets for saddles and other parts of harness are made with ventilating perforations through the bearing parts. In girth brackets the succeeding hooks or bearing parts are made to project more and more, that the girths may hang separately. The articles made as before described are to be galvanised by preference.

Norton, J. L., and E. Wilkinson. *An improvement in extracting oil and grease from wool previous to its being manufactured into yarn or fabrics, and in scouring or cleansing such wool, yarn, and fabrics.* Dated Oct. 31, 1857. (No. 2778.)

The wool, &c., is placed in a cylinder, with openings to allow the grease, &c., to pass therefrom when subjected to pressure. A stream of hot water or steam is introduced into the cylinder, and allowed to pass out at the bottom through a tap, until the wool, &c., becomes heated to such a temperature that, when subjected to pressure, the water and the oil will flow freely from the cylinder. The cylinder is fixed on wheels, and runs on a tramway, and is placed upon the ram of a hydraulic press and subjected to great pressure.

Isoord, M. F. *Improvements in producing heat and light.* Dated Nov. 2, 1857. (No. 2782.)

This consists in charging superheated steam with hydrocarbons derived from heating tar, &c., and it is proposed to manage this so that the steam may be at the same time decomposed into a mixture of hydrogen available for producing heat and light.

Iles, C. *Improvements in wardrobes or similar receptacles for articles of dress, and in stands, frames, and pins for holding or suspending articles of dress.* Dated Nov. 2, 1857. (No. 2783.)

This consists, 1. In making wardrobes, &c., either wholly or partly of metal, and also in combining a mirror or looking-glass with them. 2. In making frames or racks, having pins or pegs for holding articles of dress, so that the frames or racks shall be portable. 3. In the use of cast metal in combination with wrought metal, for uniting and ornamenting the various parts of hat and umbrella stands. 4. In combining a mirror with such frames or racks. 5. In making hat pins or pegs of more than one piece of metal, and afterwards uniting the pieces by soldering.

Apperly, J., and W. Clissold. *Improved means of, and apparatus for, feeding fuel to furnaces.* Dated Nov. 2, 1857. (No. 2784.)

This relates to the adaptation to the fire-places of furnaces of a moveable frame, plate, or chamber, which is capable of being moved into, and out of, the furnace above, or at the side of the fire bars, through an opening or openings made in, or above, or at the side of the door. The object is to spread the fuel evenly over the fire bars.

Apperly, J., and W. Clissold. *Improvements applicable to carding and condensing engines.* Dated Nov. 2, 1857. (No. 2785.)

In place of doffing the fibres from the doffer by means of a comb, the patentees effect this by an endless band covered with wire cards or card teeth. This band is mounted vertically on rollers, arranged so as to cause the surface of the card teeth of the endless cloth or band to touch the surface of the doffer throughout its whole length.

Mallison, J., jun. *Certain improvements in "gassing" yarn and textile fabrics, and in the apparatus connected therewith.* Dated Nov. 3, 1857. (No. 2788.)

This is designed for "gassing" or singeing yarns or fabrics without subjecting them to the discoloration consequent upon passing them through a flame of gas evolving smoke unconsumed. The apparatus consists in a metallic burner or guide for the flame, the lower end broad and open, and the upper terminating in a narrow open slit. The gas is turned on to such a height as to allow a small jet of light or blue flame to project a short distance above the top of the narrow slit. Through this flame the yarn, &c., is to be passed.

Waffenstein, R. *Improvements in doctors or scrapers used for cleaning engraved surfaces.* Dated Nov. 3, 1857. (No. 2793.)

The patentee claims the application of horn, or any compound of horn, or other substances, for the manufacture of "doctors" for cleaning engraved surfaces used in printing woven fabrics.

Sacre, A. C., sen. *An improved apparatus for measuring water.* Dated Nov. 3, 1857. (No. 2794.)

The meter is divided by a horizontal partition into two compartments; the upper one contains the measuring apparatus, and the lower one the water after it has been measured. The measuring apparatus consists of a float at one end of a rock-

ing lever, which extends across the measuring chamber, and has its fulcrum at its other extremity, and between the float and the fulcrum it is connected to a weighted arm and an arrangement of trip levers, by which the entrance and exit valves are actuated at the proper time. The float lever is also connected with counting apparatus.

SMITHEN, J. *Improvements in machinery for cutting cork.* Dated Nov. 3, 1857. (No. 2796.)

This consists in the use of an endless or band knife made to move round pulleys, and of a drum on one side, or two drums, one at each side of the machine, for holding the cork to be cut. When there are two drums the same knife cuts the corks presented to it by the two drums.

DUBUS, R. I. C. *A method of treating certain plants or vegetable substances in order to extract from the same, 1st, a kind of fecula or farina proper, both for alimentary and finishing or starching purposes; 2nd, an alcoholic liquor; and, 3rd, a natural ferment or yeast.* Dated Nov. 4, 1857. (No. 2801.)

The plant used for the purposes indicated above is the bulb of the Turk's cap lily. The invention is carried into effect by a certain process of washing, draining, drying, &c.

AMOS, C. E. *An improved arrangement of steam machinery for driving rotary pumps.* Dated Nov. 4, 1857. (No. 2802.)

This invention was described and illustrated at p. 1 of our last Number.

CLAY, C. *Improvements in machinery for grubbing or cutting up weeds, and otherwise scarifying and cultivating land.* Dated Nov. 4, 1857. (No. 2803.)

Here a frame of iron is constructed, which at the hinder angles is supported by two uprights, capable of adjustment as to height from the land. At the lower end of each upright is a wheel. At the fore end of the frame is an upright spindle, which has at its lower end a wheel, and such spindle is also adjustable, and capable of turning in its bearings. Transversely of the frame are parallel bars, each turning in bearings. To these bars are affixed the stems of tines. The stems are bent back and then downwards, in a curved form to the point, and are capable of adjustment on their bars. Each of the transverse parallel bars has a projection at the upper part thereof, attached by links to a lever, having its fulcrum at the hinder part of the implement, by which means the several tines may be readily raised from and lowered to the earth.

MILLER, J. *An improved arrangement of marine steam engines.* Dated Nov. 4, 1857. (No. 2805.)

This invention was described and illustrated at p. 505 of No. 1816, Vol. 68.

SIMPSON, G. R. and D. C. *Improvements in spring blinds.* Dated Nov. 5, 1857. (No. 2806.)

As to the spring roller blind, the patentees use an india rubber band, made fast on one end of the top lath, or on top of the frame-work that supports the roller. This band is carried about one-half the length of the frame-work, and to which is fastened a piece of cat-gut. The end of this cat-gut is brought over a wheel through the frame-work, and attached to the barrel that is fastened on one end of the roller. By pulling down the blind, the barrel is made to revolve, the india rubber to expand, and the blind becomes in a springing state. As to the Venetian blind, they use a roller, instead of the small pulley wheels at present in use.

BEINHAUER, H. *Improved machinery for drawing or extracting water from mines, wells, pits, or other deep places, by means of suction.* Dated Nov. 5, 1857. (No. 2810.)

The patentee employs a series of vessels placed at different levels, to receive the ascending columns of water, and transmit them to a higher elevation, and is thus enabled to make use of the atmospheric pressure to render the sucking action efficient for raising the water to any required height. These vessels are made air-tight, and provided with atmospheric valves to admit air thereto at certain periods of the operation.

COUSINS, J. J. *Improvements in the construction of steam ploughs.* Dated Nov. 5, 1857. (No. 2811.)

This invention is described and illustrated in the first article of this Number.

PALMER, H. R. *An improved stamping and endorsing machine.* Dated Nov. 5, 1857. (No. 2814.)

Here, the patentee makes use of a handle, to which are jointed radius links or bars moving on fixed centres, and forming a parallel motion, whereby the movement of the handle is guided so as to cause the surface of the stamp or die affixed thereto to meet the surfaces of the inking and stamping cushions in a parallel manner. The inking and stamping cushions are circular, and larger than the die intended to be used therewith.

AITCHISON, R. K. *An improved break applicable to wheeled carriages.* Dated Nov. 6, 1857. (No. 2816.)

This relates chiefly to wheeled carriages used upon common roads, drawn by two or more horses, but with slight variations may be adapted to single-horse vehicles. It consists in so fitting the break that as soon as the horses are checked it is spontaneously applied with a force corresponding with the force of the check given to the horses. The break will always act when the vehicle is descending a hill. The inner end of the pole puts the break in action by acting upon certain levers.

CANOUIL, G. *Improvements in the manufacture of matches.* Dated Nov. 6, 1857. (No. 2817.)

This consists in providing matches with igniting materials not containing either phosphorus or any other poisonous substance, and capable of being ignited by friction, either against ground glass, china, paper, or cardboard, or a prepared surface. A great variety of materials are enumerated.

BESSEMER, H. *Improvements in the manufacture of malleable iron and steel, and also in the manufacture of railway bars and other bars, plates, and rods, from iron or steel so manufactured.* Dated Nov. 6, 1857. (No. 2819.)

The object of the present invention is to lessen or entirely remove the defects of cells or cavities from ingots, as well as their "hot short" character, when treated by Mr. Bessemer's blowing-in process. The patentee constructs a circular mould which he mounts on a vertical axis in a strong iron frame, and which axis is made by suitable straps or gearing to revolve at a very rapid rate. In the central part of the mould he fits a disc of fire-clay, stone, or wood, around which a cavity is formed, somewhat of the shape that would be required to form the rim of a fly-wheel, the upper part of the mould being open in the central part and covered at the edges. A more complete description of the invention cannot be given without engravings.

MACNAB, W. *Improvements in vessels propelled by screw or other similar propellers.* Dated Nov. 6, 1857. (No. 2820.)

Here the vessel is fitted to receive two propellers, mounted on two parallel shafts, and either totally submerged or only partially so. To adapt the vessel to receive these propellers, it is constructed with two stern posts, and between these the propellers are placed. The vessel is arranged to draw less water at the stern than elsewhere, but the stern posts and rudders descend to the full draught of the vessel.

BAINES, H. *Improvements in machinery or apparatus for the prevention of accidents, applicable to hoisting and other lifting machines.* Dated Nov. 7, 1857. (No. 2821.)

This relates to methods of arresting the descent of the box, chamber, platform, or table employed in hoists and other shafts, and of retarding the descent of the said chamber, and reducing the speed of descent to the rate of from forty to sixty feet per minute, in the event of the suspending rope or driving straps or bands of such hoists breaking or becoming loose, or in case of any other accident. The improvements consist, 1. Of rods, levers, catches, &c., connected with the box

or chamber, so that, upon the suspending rope becoming slack, a spring is liberated, which causes catches or cams to act against the sides of the shaft, or against racks placed against those sides. 2. In a combination of parts for retarding the descent of the box or chamber, consisting of friction rollers, connecting rods, catches or cams, levers, springs, &c., acting in conjunction with a governor, and arranged so that when the chamber is descending at too great a speed catches or cams may be forced against the sides of the shaft, or against racks. 3. The invention relates to hoists employed upon railways for raising and lowering waggons, &c., and consists in the application of springs in conjunction with levers, connecting rods, and catches underneath the table or platform, and so arranged that, when any one of the suspending chains breaks, all the catches shall immediately be forced into racks at the sides of the hoist.

FORDRED, J. *Improvements in treating and purifying water.* Dated Nov. 7, 1857. (No. 2822.)

The patentee has discovered several modes of purifying water in an economic manner, by the use of carbonate of lime and sulphate of lime (both natural and artificial), coke, burnt clay, wood, charcoal, and pumice stone.

ADAMS, J. *Improvements in revolver fire-arms.* Dated Nov. 7, 1857. (No. 2824.)

These improvements, several in number, cannot be intelligibly described without engravings.

WILSON, W., and J. J. J. FIELD. *Improvements in casting or moulding liquified and other substances.* Dated Nov. 7, 1857. (No. 2825.)

This consists, 1, generally in the employment of apparatus communicating with, or wholly or partly submerged in, a vessel containing the material to be moulded, whereby the said material, being forced into or through certain portions of the apparatus, comprising tube frames, moulds, or other chambers, is made to assume the required shape. 2. In a method of moulding and manufacturing candles, &c., or otherwise forcing a wick or wicks, (on which stops or nipples may be affixed to determine the lengths and the form of the nibs), through some portion of the material, and into or through a tube or a series of tubes, by which means the said nipples or stops are consequently forced through the material, and into or through the tube or tubes, and thereby sustain the wick in its proper place, and cause the said material to be propelled into or through the tube or tubes, which also assist in determining the required shape and size of the column of materials therein produced. 3. In a method of moulding tablets of soap, night lights, short candles, &c., by attaching the moulds to, or inserting them in, an endless chain or band, so that the said moulds, having a tendency to remain open, may be caused to communicate with or dip into the liquified material.

NORMANDY, A. R. LA M. DE. *Improvements in the manufacture of soap.* Dated Nov. 9, 1857. (No. 2831.)

This consists in using sulphate, sulphite, and hyposulphate of soda alone or together, and in combination with a rock or clay found in Surrey, and containing a large quantity of material soluble in a boiling alkaline solution.

PARKES, A. *Improvements in the manufacture of nails.* Dated Nov. 9, 1857. (No. 2832.)

For making nails, wire, or rods of metal of a greater diameter than the stems of the nails (which are to be made), are at intervals subjected to pressure between dies or rollers, so as to flatten out the metal, and when desired to impress the forms of the stems at intervals, leaving parts of the original diameter for the heads. Those parts which are reduced in thickness and spread out are then subjected to cutters, which cut away the excess of width. The metal after being cut transversely into lengths, each suitable for a nail, is then finished by dies, the stems being held in a bed, whilst the head is formed by a punch or die.

WEEDON, G. and T. T. *An improved knife-cleaning machine.* Dated Nov. 9, 1857. (No. 2833.)

The patentees employ a square frame of wood upon standards, about the usual height of a knife board, fitted with drawers for knives, &c. Upon this frame they affix a flat metal plate, having a sheet of gutta percha for the blades of the knives to rest upon. At the back of the machine is a narrow vertical framing fitted with circular moveable receivers, having a slot cut across each to receive a portion of the handle of the knife; the knives, being placed in position, are held by a "holdfast," composed of a square strip of timber having a handle at each end, and provided with conical shaped pieces, each having a spiral spring fixed behind in a cell cut in a strip of timber for its reception.

ELWIN, W. J. *Improvements in night lights.* Dated Nov. 9, 1857. (No. 2834.)

This consists in applying a hollow central stem or tube of metal (or other material) which sustains the wick, and maintains the flame at a uniform height during the burning of the light.

DEVON, W. *An improved self-acting apparatus for flushing water-closets, and the means of connecting the same to water mains, parts of which are applicable to the junction of gas or water pipes generally.* Dated Nov. 10, 1857. (No. 2836.)

This consists, 1. In joining and unjoining water and gas pipes to their mains without the necessity of cutting the same in case of a stoppage therein, or discontinuing the supply. 2. In regulating the flow of water or gas through the supply pipes independently of the control of the consumer. 3. In making a union joint, or what is usually termed a plumber joint, without the use of solder. 4. In an improved self-acting flushing apparatus for water-closets and urinals. 5. In a flushing apparatus for water-closets and urinals in which there is no valve, and where the chain does not require to be retained in the hand after being pulled.

ROWCLIFFE, T. *Improvements in machinery for making and pressing bricks, drain-pipes, and tiles, and in preparing material to be used for such like purposes.* Dated Nov. 10, 1857. (No. 2837.)

This invention cannot be described without engravings.

LECOINTE, C. E. *A new mode of advertising.* Dated Nov. 10, 1857. (No. 2838.)

This consists in making suitable parts of the in or outside surfaces of envelopes for letters or parcels, or of letter paper, subservient for directions, announcements, or advertisements of any kind.

PARKES, A. *Improvements in the manufacture of tubes and cylinders of copper and alloys of copper.* Dated Nov. 10, 1857. (No. 2840.)

For manufacturing these tubes or cylinders, when using ingots or masses cast hollow, they are cast in open moulds. The mould is preferred to be rectangular. Its ends are made with ledges for supporting a core by its two ends, in such a position that when the melted metal is poured in the metal may be as thick above as below the core; or the ingots are cast solid, and then a hole drilled through each, and a saw cut put through the ingot, which is then to be extended and opened as heretofore. The patentee has found that the casting of hollow ingots is greatly improved by employing reducing alkaline fluxes, when melting copper or copper and its alloys preparatory to casting. When using sheet copper, for making cylinders or tubes for printers, he employs silver, or silver solder, for joining the edges.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

MARTIN, R., E. HALL, and J. HALL. *Improvements in steam hammers.* Dated Oct. 31, 1857. (No. 2769.)

This relates to forging or stamping hammers to be worked by the intermittent action of steam and the atmosphere. It consists of a cylinder open

below, with a valve near the top for the admission of steam above the piston. To the top of the piston rod is attached a rope, which passes over pulleys, and to it is secured the hammer, which moves in a vertical frame. The valve employed is of the ordinary construction, with a triangular slot on the upper part of the sliding face, so that, as the roller is being opened, a thin jet of steam is admitted when the apex of the slot passes below the top of the inlet. The flow of steam gradually increases with the increasing area of the slot, until the full volume of steam is admitted; this depresses the piston, which draws the rope and weight with it. The movement of a lever then closes the steam valve, and opens, at the same instant, a stop tap attached to the exhaust pipe. The pressure of the atmosphere on the under side of the piston then assists the descent of the hammer.

Brooman, R. A. *Improvements in the construction of boats.* (A communication.) Dated Oct. 31, 1857. (No. 2771.)

This consists in the construction of collapsible boats which can be readily expanded, and which, when folded, can be easily stowed, and occupy but little space. The frame of the boat is composed of iron, and is covered externally with caoutchouc cloth.

Woodhead, W. J., and J. *Improvements in the manufacture of kiln tiles, and in the machinery or apparatus employed therein.* Dated Oct. 31, 1857. (No. 2773.)

Here, the inventors employ a mould with a perforated plate, and arrange in one block instruments corresponding in form and size to the apertures in the plate, and as many as there are perforations therein, with pins or points at the end of each. This block they affix to the plunger of a fly press, so that the whole series can be pressed through the perforations in the plate into the clay in the mould, forcing the surplus through holes in the mould, thus producing the complete form of tile at one operation. The tile is then lifted out by a ever operating upon a loose or false bottom.

Gabbitass, P. *Improvements in washing machines.* Dated Oct. 31, 1857. (No. 2774.)

This consists mainly in a peculiarly constructed frame, rotated within a circular vessel, the frame being suspended from a spiral spring to assist in giving it repeated upward and downward motions when in use; a number of perforated wood balls, having central rounded projections, are also employed to work loosely within the vessel.

Kirkman, R. *Improvements in the fusees of lever and other watches.* Dated Nov. 2, 1857. (No. 2779.)

Here, in that part of the fusee called the "top," in place of the brass little packet hitherto used, the inventor substitutes a steel one. He screws the ratchet fusee, brass, and cap together in one solid piece, instead of simply pinning such ratchet to the fusee brass only, and without being secured to the cap.

Matthews, N. *Improvements in pumps.* Dated Nov. 2, 1857. (No. 2780.)

Here, the bucket employed is solid, and the pump rod passes through a stuffing box at the top of the working barrel. On each side of the barrel is a pipe, and both are connected to the upper part of the barrel above the stroke of the bucket. One of these pipes is closed at the top, and its lower end communicates with the pump tree below the foot valve or clack. The lower end of the other pipe communicates with the pump tree or barrel above the foot valve or clack, and its upper end serves as the discharge pipe. These two pipes are furnished with valves or clacks, so arranged that, upon each upward or downward stroke of the bucket, the water shall be drawn through the one and lifted or forced through the other alternately, producing a constant stream.

Murray, R. *Preventing accidents on railways.* Dated Nov. 2, 1857. (No. 2781.)

Here, a gong is fixed at each end of a railway rain, and a connexion formed by a twisted wire cord to every carriage, the wire passing over wheels elevated above the carriages, and, being brought down diagonally to a wheel fixed to the end of each carriage, fastened to levers hung perpendicularly, acted upon by other levers horizontally, and supported by a steel spring, causing the treadle to be constantly raised except when acted upon by pressure. Any person aware of danger in a train can thus communicate with the engine driver and also the guard at the same time. A signal is also made indicating the compartment. Also, a gong will be fixed at the side of the engine or tender, to supersede the use of detonating balls, and to give any servant on the line an opportunity of apprising the driver or guard of danger.

Fontainemoreau, P. A. de. *Improvements in marine or condensing steam engines.* (A communication.) Dated Nov. 3, 1857. (No. 2786.)

These consist, 1. Of an improved air pump. 2. In a mode of economising waste steam. 3. In usefully employing the waste water of the condenser. 4. Of a syphon exhaust bilge pump. The improved air pump is made double, each pump having a double action.

Hoga, S. *Improvements in electric telegraphs.* Dated Nov. 3, 1857. (No. 2787.)

The inventor proposes to enable two communicants to convey intelligence to two recipients at the same moment, without any danger of the telegrams being intermingled; and this he proposes to effect where a single wire only is used. Where two wires are used, four messages may be sent and received momentarily, and so on.

Boyd, J. E. *Improvements in skates.* Dated Nov. 3, 1857. (No. 2789.)

The skate iron is to be so formed and fitted as to be capable of being shifted in a variety of ways, so that the skater may vary his sport from curling or fancy skating to that of ordinary skating, or otherwise.

Curtis, W. J. *Improvements in machinery used for slotting, boring, and surfacing.* Dated Nov. 3, 1857. (No. 2790.)

A boring bar is used, having a screw thread at one end. On the bar there are two cog wheels, the nave of one having an internal feather or projection, which enters a groove in the bar, and the nave of the other a female screw, fitting the male screw on the bar. Motion is communicated to the cog wheels by two pinions on the same axis. To this axis motion is communicated, and the pinions can be slid along the axis into or out of gear with the cog wheels. The motion of the cog wheel, in which there is a feather, causes the bar to rotate, and the motion of that in which there is a female screw causes the bar to advance. If a boring tool is placed on the end of the bar, and both pinions are geared with the cog wheels, the bar receives a rotary and a slow forward motion. When used for slotting, one pinion is thrown out of gear, and the other causes the bar to advance without rotating. When used for surfacing, the bar is caused to rotate without advancing.

Harcourt, D. *Improvements in wrenches.* Dated Nov. 3, 1857. (No. 2791.)

One of the limbs of a wrench is formed with a male screw to receive a screw nut. On this limb there is a sliding socket, formed so as not to move around the limb, but only to slide thereon. This socket carries the axis of the moveable jaw.

Sweet, H. K. *Improvements in photographic portraits and pictures.* (A communication.) Dated Nov. 3, 1857. (No. 2792.)

This consists in taking portraits, &c., on concave or convex plates of glass, &c.

Newton, W. E. *Improved machinery for cutting files.* (A communication.) Dated Nov. 3, 1857. (No. 2795.)

This consists in controlling the operation of the chisel, so that the depth of every cut may be the same from end to end of the file, notwithstanding

the longitudinal curvature of the faces, or that the successive cuts may be made of a gradually increasing or diminishing depth at pleasure. It also consists in controlling the position of the file blank during the cutting operation, whereby each cut is caused to be of uniform depth all across the file. For these purposes a moveable wedge piece is employed at the top of the toggle by which the cutter is operated, and is combined with a foot piece fitted with a shoe that rests upon the blank.

LAMING, R. *Improvements in purifying gas, and in apparatus useful for that purpose.* Dated Nov. 4, 1857. (No. 2797.)

This relates to a patent of the patentee dated Feb. 3rd, 1857. It consists in substituting for the small holes intended to divide the gas in the washing liquid other arrangements, with the object not only of washing the gas with a minimum quantity of the liquid used, while no greater resistance is opposed to the passage of the gas than may suit the circumstances of the works, but also to reduce the current of impure gas to a thin stratum, while it is brought into contact with a stream of purifying liquid, occupying great area, but so confined within channels as to be less liable to stagnate than in the case of the former double diaphragm scrubber.

BATHO, W. F., and E. M. BAUER. *Improvements in machinery or apparatus for drilling and boring metals, and also for cutting key-ways and cotter holes.* Dated Nov. 4, 1857. (No. 2798.)

The documents relating to this invention are before the Lord Chancellor, the application having been opposed at the Great Seal.

HIGGINSON, F. *Submerging, extending, and laying down submarine, electric, magnetic, and every other description of submerged or immersed electrical telegraph cables, wire ropes, and combined wire, gutta percha, spun yarn, or other compound electrical cables whatsoever.* Dated Nov. 4, 1857. (No. 2799.)

The object here is to prevent the breakage of telegraph cables by attaching them to chain cables and by providing an auxiliary engine for paying out and heaving up the cables. An apparatus consisting of a revolving drum and windlass, fitted with brake straps, in combination with a series of nippers, is applied in cases of necessity.

MURPHY, J. *Improvements in the permanent way of railways.* Dated Nov. 4, 1857. (No. 2800.)

The inventor makes a fish plate by first taking a flat iron plate, in the centre of which the ends of two rails will rest longitudinally, and then rolling out or casting a pair of plates, so that one may be placed on each side of the rail, covering the plate first mentioned, and running up the rail till they arrive under the top thereof, and fitting exactly the form of the rail, and serving to support the same. He secures the combination together by passing several screw bolts through the lower and one of the upper plates and by using nuts to allow the removal of the rail where required; the plate on the other side will be riveted only. To secure the upper portions of the supporting plates with the rail, he passes screw bolts through both the plates and the rails (on each side of the joint of the rails), and secures them with nuts. He also proposes to place (to provide against the jar of metal against metal) thin strips of wood between the plates and sides of rails.

HOUGHTON, J. *An improvement in braces.* Dated Nov. 4, 1857. (No. 2804.)

This consists in constructing a compensating brace, by connecting the ends which pass over the shoulder to the back by a cord to a frame carrying two pulleys, half round one of which the cord passes. Round the other pulley another cord, the ends of which are united to the two back tabs, is passed.

BUNNETT, J. *Improvements in machinery for bending and shaping metals.* Dated Nov. 5, 1857. (No. 2807.)

These consist of a machine for bending strips of plate iron in lengths for forming revolving iron shutters, &c., so that by a combined action revolving dies are made to press simultaneously on each side of the strip or lath of plate iron, turning both edges, and forming the lath complete at one operation.

BESSEMER, H. *Improvements in treating iron ores.* Dated Nov. 5, 1857. (No. 2808.)

This consists in the use of superheated steam, or other highly heated gases, for roasting iron ores in chambers heated externally.

ROBINSON, G. *Improvements in apparatus for shelling or hulling coffee and other berries and seeds.* Dated Nov. 5, 1857. (No. 2809.)

This consists in the use of a rotary beater revolving within a cylinder of woven wire or other reticulated material, in which the berries or seed are so acted on as to separate the hull or shell therefrom.

HOCHSTAETTER, H. *An improved machine for the manufacture of matches.* Dated Nov. 5, 1857. (No. 2812.)

This is designed for holding splints of wood, &c., whilst they are being dipped in an igniting composition. A frame or clamp to receive the splints is placed upon the machine, and certain mechanism is brought into action for separating some small boards sufficiently to allow the splints to fall between them at a regular distance from one another. There is a box for containing the splints. This box has openings formed at the under side thereof, at the distance apart which the splints are required to be; the frame or clamp has a shaking motion imparted thereto by mechanism, which causes the splints to fall from the box between the boards in the frame. The boards are then pressed together, and the frame removed, and another put into its place.

SHARMAN, W. *An improved metallic compound, applicable to the manufacture of useful and ornamental articles for which German silver and compounds of German silver are at present used.* Dated Nov. 5, 1857. (No. 2813.)

This relates to the preparation of an alloy of zinc from 35 to 90 per cent., and tin from 10 to 65 per cent. The zinc is melted and the tin added, stirring with a stick meanwhile in order to ensure perfect mixture. The alloy may be rolled in the same manner as zinc, and then annealed. That containing upwards of 75 per cent. zinc is adapted for casting.

LIPSCOMBE, F. *Improvements in the mode of conveying water and other liquids.* Dated Nov. 6, 1857. (No. 2815.)

This invention was described at p. 461, No. 1798, Vol. 67.

ANDERTON, W. *New railway chairs.* Dated Nov. 6, 1857. (No. 2818.)

These chairs are of iron, cast in halves longitudinally, each half being so formed that a space is left to admit the lower side of a double-headed rail. There is also a sufficient thickness of metal in the chair under the rail to admit of the two halves being bolted together underneath the rail. The whole of the lower head and neck of the rails are covered by the chair, which keeps the rail steady and tight. This chair only requires one sleeper, to which it is fastened by spikes of the ordinary construction.

PEPPER, J. H. *Improvements in displaying various devices when revolving discs or surfaces are used.* Dated Nov. 7, 1857. (No. 2823.)

Here, to obtain illusions and other interesting effects, the devices are produced on a large disc arranged to revolve with considerable velocity. Opposite such disc, and at a distance from it, a lantern with by preference an oxyhydrogen, electric, or other powerful light is placed, before which a rotating screen or disc is applied, having slits or openings through it.

BROTHERHOOD, P. *Improvements in boilers and furnaces.* Dated Nov. 9, 1857. (No. 2826.)

Instead of fire bars, the fuel rests upon a per-

forated metal plate, in the holes of which are inserted the upper ends of vertical tubes, their lower ends being secured in a corresponding perforated plate, so as to form a hollow chamber beneath the fire, through which chamber the water circulates in connection with the rest of the water in the other part of the boiler. The flame, &c., passes down through these tubes, then up round a midfeather into the horizontal tubes in the cylindrical part of the boiler, and out of the chimney. The fresh fuel being placed on top of the fire, the generated gases are drawn downward, pass through the ignited fuel, enter into combustion, and pass through the cylindrical part of the boiler.

HARDIE, W. *An improved stereoscope.* Dated Nov. 9, 1857. (No. 2827.)

The optical part of the instrument consists of two plain mirrors, side by side, with their reflecting surfaces at right angles to a vertical plane midway between them, but inclined to each other at an angle bearing a relation to the positions of the pictures. The pictures are viewed by reflection from these mirrors. The pictures must be placed one above the other, and with a lateral separation of the corresponding vanishing points.

STOTHARD, D. J., JONES, J., and D. and B. W. JONAS. *An improved ship's block.* Dated Nov. 9, 1857. (No. 2828.)

This consists of an outer sheath or block furnished with a curvilinear shaped channel, in which two pulley wheels are so arranged as to admit of the rope, cable, &c., impinging upon their peripheries so as to increase or diminish the space between the same through the medium of a concentric slot bearing, in which the lesser wheel revolves, the larger or fixed wheel moving from a common centre as heretofore.

BALESTRINI, P. A. *Improvements in machinery and apparatus for paying out submarine telegraph cables, and for regulating and controlling the paying out thereof.* Dated Nov. 9, 1857. (No. 2829.)

This machine consists of a drum, levers, grooved pulley, and springs. The lever or levers are fixed at one end to the axis of the drum, which forms the axis of oscillation of the levers. At the opposite ends the levers carry plummer blocks for the axle of a grooved pulley. These plummer blocks are free to slide up and down in guides fixed on the levers. Between the upper surface of the levers and the bottom of the plummer blocks, there are springs to keep the blocks and the grooved pulley under the ordinary strain of the cable raised from the levers. Near the drum and under the levers are springs upon which the levers rest, as upon fulcrums. The cable is brought from the hold and passed round the drum, then over the grooved pulley into the water. Should the strain of the cable be increased, the grooved pulley will first yield, and should the strain overcome the springs under the bearings, the levers will in turn be depressed until the outer end thereof is so far lowered that the cable runs from the drum without any retarding force. As soon as the extra strain is removed, the levers and pulleys rise and assume their former positions. To regulate the rate of rotation of the drum, the inventor connects the axis of the drum with a shaft carrying paddles which revolve in water or air. Pump cocks are provided for drawing off liquid from the vessels in which the paddles move. The inventor also uses brakes composed of friction bands attached to a weighted lever, upon which the position of the weight can be altered to increase or diminish the leverage. Indicating dials are used to show the speed of the vessel and the cable, and the tension thereof.

PINKER, J. *Improvements in governors for marine steam engines.* Dated Nov. 9, 1857. (No. 2830.)

The throttle or other valve is arranged to be acted on by a weighted lever, by fixing a pinion, or curved toothed rack, on the spindle of the valve, and applying a curved rack on one end of the weighted lever. As the weighted lever tends to hang perpendicularly, any change in the vessel which causes the propelling machinery to be less submerged will bring the lever to act on the valve so as more or less to close it.

REEVE, J. *Improvements in propelling vessels.* Dated Nov. 9, 1857. (No. 2835.)

This consists in the use of steam in the direct line of propulsion, but in which the motion of the piston is multiplied greatly by the introduction of lazy tongs, by which the motion of the piston is transmitted to the propelling surfaces. The propelling surfaces employed consist of surfaces which expand in the act of propelling, but collapse during the retrograde stroke.

TOWNSEND, J. *Improvements in the manufacture or production of sulphurous acid.* Dated Nov. 10, 1857. (No. 2839.)

This consists in burning pyrites, so that by the heat thus generated a further quantity of sulphurous acid may be disengaged from other sulphides, sulphates, &c., placed in a layer over the burning pyrites.

BOUSFIELD, G. T. *Improvements in castors.* (A communication.) Dated Nov. 12, 1857. (No. 2857.)

Here, each castor is made with one large and several small spheres. The largest sphere is the one which forms the roller and comes to the floor. Directly above this there is one smaller sphere (or one above another), which bears the weight of the article of furniture, and reduces the friction on the larger sphere. There are other spheres around the large sphere to reduce the lateral friction, and to facilitate the rotation of the large sphere.

SHEPPARD, G. *Improved machinery for cultivating land, or for cutting up and pulverizing the surface thereof.* Dated Nov. 13, 1857. (No. 2859.)

These consist principally in the use of a rotating horizontal plate wheel or platform, mounted on a vertical shaft, supported in bearings on the carriage. On the under side of this rotating plate are fixed vertical knives about 9 inches long, so arranged as to project below the rotating frame, which must also be capable of being raised and lowered at will. The framework is supported upon running wheels, the motion of which is transmitted by gearing to the rotating platform, so that, as the implement is drawn forward, the rotating frame may be driven with considerable speed, and, upon lowering the rotating frame, the vertical knives will be made to enter and cut into the surface of the land.

PROVISIONAL PROTECTIONS.

Dated March 6, 1858.

460. P. A. Cap, of Paris, Knight of the Legion of Honour. An improved construction of billiard table for drawing-rooms.

Dated May 19, 1858.

1112. H. Walker, of Gresham-street, needle manufacturer. Improvements in the manufacture of needles.

Dated May 29, 1858.

1214. T. V. Lee, of Thames-chambers, Adelphi, civil engineer. Improvements in the construction of steam generators, applicable to marine, locomotive, and all other uses where steam is applied as the motive power.

1216. D. Hebson, of Liverpool, consulting engineer. Improvements in ships' gear, part of which is applicable to forming ropes for general purposes.

Dated June 3, 1858.

1248. T. Scholefield, of Paris, gas meter manufacturer. Improvements in gas meters.

Dated June 8, 1858.

1286. R. Wappenstein, of Manchester, engraver. Improvements in the manufacture of artificial whalebone, applicable to umbrellas, parasols, stays, hats, bonnets, reeds, crinolines, and other similar purposes.

1288. J. C. Quince, of Crosby-hall-chambers, Bishopsgate, commission agent. Improvements in stoppers for bottles and jars.

1292. J. Bunnett, of Deptford. Improvements in the construction of floors, roofs, and arches.

1294. J. Rawlings, of Collingbourn Ducis, Wilts. Improvements in thrashing machines.

Dated June 9, 1858.

1296. G. Suares, of Cullum-street, city, merchant. An improvement in fire-arms. A communication from V. Collette, of Liége.

1298. D. Moseley, of Manchester, manufacturer. Improvements in machinery used in the manufacture of vulcanised india rubber thread.

1300. E. T. Hughes, of Chancery-lane. Improvements in machinery or apparatus for sowing grain. A communication from A. A. Scabell.

1302. W. A. Gilbee, of South-street, Finsbury. Improvements in the construction of railway wheels. A communication.

1304. J. Easterbrook, of Sheffield, tool manufacturer. An improvement in ratchet braces.

1306. T. W. G. Treeby, of Paddington. Improvements in revolving fire-arms and cannon and cartridges.

1308. T. Robinson, of Manchester, brass founder, and H. Ogden, of the same place, engineer. Improvements in safety lamps and in apparatus connected therewith.

1310. C. Cammell, of Sheffield, steel manufacturer. Improvements in railway buffers.

Dated June 10, 1858.

1312. G. Castle, of Croydon. Ventilating women's stays by means of perforation.

1314. J. Luis, of Welbeck-street. An alembic wine examiner. A communication.

1316. J. Luis, of Welbeck-street. An improved balance-beam thrashing machine. A communication.

1318. T. Chatwin and C. Taylor, of Birmingham, machinists. Improvements in screw stocks.

1322. H. Reynolds, of King William-street, city, gentleman. An improved method of separating glycerine from saline and other substances.

1324. W. C. Wilkins, of Long Acre, lighthouse engineer. Improvements in lighthouses.

Dated June 11, 1858.

1328. G. Bartholomew, of Linlithgow, edge tool maker. Improvements in that description of gas meters commonly called wet meters.

1330. S. Cheavin, of Spalding, Lincoln, plumber. An improved preparation or combination of mineral substances, applicable for use as a pigment cement or mastic, or to be used either alone or in combination with other well-known materials for washing, scouring, cleansing, or bleaching purposes.

1332. G. W. Hart, of Southsea. Improvements in the manufacture of locks.

Dated June 12, 1858.

1334. G. T. Stieler, of Manchester, engineer. Improvements in the means for generating steam and economising fuel.

1336. W. Clark, of Chancery-lane. Improvements in machinery for combing cotton and other fibrous material. A communication from J. J. Bourcart.

Dated June 14, 1858.

1340. W. Clark, of Chancery-lane. Improvements in curtain poles or rods. A communication from A. Loustaunau.

1342. H. J. Daniell, of Donington-park, Derby, Colonel. A process by which the stamp on bankers' cheques is cancelled, and the cheque indelibly and simultaneously crossed.

1344. G. Neall, of Northampton, gas engineer. Improvements in gas stoves for warming, cooking, and other purposes; as also in the saucepans, kettles, or other utensils to be used with the same.

1346. J. H. Johnson, of Lincoln's Inn-fields. Improvements in machinery or apparatus for breaking or crushing stones for road metal, and other purposes, and for crushing ores and other hard and brittle substances. A communication from E. W. Blake, of Newhaven.

Dated June 17, 1858.

1369. J. H. Marsden, Manchester, hat manufacturer. Certain improvements in the manufacture of hats.

1371. J. Haslam, of Preston. Improvements in looms for weaving, and also in shuttles and pickers connected therewith.

1373. A. Dawson, of Barnes-place, Mile End-road, engineer. Improved apparatus for converting small coals or coal dust, or small coals and coke, or coal dust and coke, with the admixture of water or other materials, into artificial fuel.

1375. S. and D. Taylor, of Rochdale, machinists. Improvements in machinery or apparatus for putting machine straps or belts on to pulleys or drums, and for removing the same.

Dated June 18, 1858.

1379. R. S. Newall, of Gateshead. Improvements in the manufacture of cords, ropes, and cables.

1381. P. B. E. Martin, of Paris, civil engineer. Improvements in obtaining electro-motive power.

Dated June 19, 1858.

1383. S. Hewitt, of Manchester, commission agent. An improved application of printed designs to cotton and other fabrics, and for improvements in the treatment during the processes of printing and finishing such fabrics.

1385. J. Bradshaw, of Bolton-le-moors, millwright. Certain improvements in apparatus for obtaining and producing motive power.

1387. R. and T. Winans, of Baltimore, U.S. A new and improved steam vessel.

1389. R. and T. Winans, of Baltimore, U.S. A new and useful improvement in the mode of combining the engines and propeller shafts of steam vessels.

1391. H. Becu, of Merville, France. Improvements in the manufacture of laths, and in fixing and nailing the same.

Dated June 21, 1858.

1393. H. H. Henson, of Parliament-street, Westminster. Preserving or waterproofing ropes, strands, cordage, cables, and other similar articles.

1395. R. A. Brooman, of 166, Fleet-street, London, editor of the *Mechanics' Magazine* and patent agent. Improvements in treating wood to preserve and colour it, and in apparatuses to be employed therein. A communication from Messrs. Légé and Pironnet.

1397. J. Crossley, of St. Helens, glass manufacturer. Improvements in machinery for grinding, smoothing, and polishing glass.

1399. W. Thrift and A. High, of Bedford-street, Commercial-road East, plumbers. Improvements in house water-closets.

1401. A. V. Newton, of Chancery-lane. An improvement in the manufacture of spoons and forks. A communication.

1403. G. R. Scriven, of Philadelphia, U.S., gentleman. An improved apparatus for ventilating, and for circulating, moving, or otherwise acting upon air or other fluids.

Dated June 22, 1858.

1405. M. Mayall, of Mossley, Lancaster, cotton spinner, and G. Jackson, of the same place, manager. Improvements in machinery or apparatus for spinning cotton and other fibrous substances.

1407. W. and J. Galloway, of Manchester, engineers. Improvements in machinery for cutting, bruising, chipping, and rasping, and otherwise treating or preparing dye woods and roots or other vegetable substances.

1409. J. A. Rainé, of Wells-street, Gray's Inn-road, gentleman. Improvements in collapsible framework for bedsteads, sofas, and other like articles of furniture.

1411. P. Brown and B. Young, of Spa-road, Bermondsey, glue manufacturers. Improvements in the manufacture of white lead.

1413. J. Robertson, of Glasgow, machinist. Improvements in apparatus for regulating the flow or passage of fluids. A communication.

Dated June 23, 1858.

1415. T. Spencer, of Euston-road, analytical chemist. Improvements in the treatment of iron ores and ferruginous sands, and certain applications arising therefrom.

1417. P. J. Livsey, of Manchester, engineer, and F. L. Stott, of Rochdale, machine maker. Improvements applicable to machinery for warping yarns or threads.

1419. R. Armstrong, of North Woolwich, consulting engineer. Improvements in steam boilers and furnaces. Partly a communication from D. W. Bowman.

1421. R. Rumney, of Manchester, manufacturing chemist, James Mellor, of the same place, chemist, and W. S. Macdonald, of the same place, mechanic. Improvements in dyeing and printing cotton, wool, silk, and other materials and fabrics.

PATENTS APPLIED FOR WITH COMPLETE SPECIFICATION.

1431. C. W. Cahoon, of Maine, U.S. An improved machine for sowing seed or fertilizing material or other substances broad-cast. Dated 24th June, 1858.

1440. T. Lemon, of Cardiff, agricultural implement manufacturer. Improving Cartwright's original patent chain harrow. Dated 26th June, 1858.

NOTICES OF INTENTION TO PROCEED.

(From the "London Gazette," July 6, 1858.)

354. E. Toynbee. "Manure."
363. C. Girardet. "Moveable shaft bearer."
371. R. F. Miller. "Omnibuses."
374. J. Arnold. "Metallic pistons."
375. J. B. Barnes and J. Loach. "Apparatus for descending and ascending mines."
391. L. Galli. "A process of superseding wood engraving."
399. A. Von Schuttenbach. "Treating fatty and oily matters."
401. J. K. Field. "Lamps." A communication.
407. J. Skelly. "Carriage springs."
409. R. A. Brooman. "Separating substances of different specific gravities; washing sands and earths." A communication.
412. W. Hooper. "Buffer and other springs."
425. G. A. Biddell. "Cutting vegetable and other substances."
434. P. Moore. "Hinges."
458. J. W. Clare. "Retarding railway trains and communicating signals."
460. P. A. Cap. "Billiard tables."
464. J. H. M. Maissiat. "Dibbling machinery."
477. G. F. Harrington. "Artificial teeth and palates."
481. G. Davies. "Ring bolt." A communication.
487. G. Davies. "Life boats." A communication.
517. S. T. Osmond and E. D. Collins. "Ploughs."
547. R. A. Brooman. "Boxes or cases for trees, &c." A communication.
570. J. M. May. "Fastenings." A communication.
615. C. Chevallier, M. I. Olivier, and E. Rolland. "Shoes and boots."
627. W. Crook. "Looms."
777. S. T. Parmelee. "Belting for machinery."
796. R. A. Brooman. "Cranes." A communication.
812. J. Knight. "Cleansing fabrics."
825. P. Brotherhood. "Steam boilers."
831. J. H. Johnson. "Preparing printing surfaces." A communication.
884. G. Gilmour. "A telegraph cable or rope shackle."
1076. J. Hamilton. "Starch."
1168. P. Griffiths. "Bushes for fixing drums on shafts."
1199. C. Stanley and J. Fittall. "Skylights and glass roofing."
1258. J. F. Dickson. "Permanent way of railways."
1346. J. H. Johnson. "Breaking or crushing stones." A communication.
1357. J. Rubery and T. Warwick. "Umbrellas, parasols, and lingoes."
1391. H. Becu. "Laths; fixing the same."
1413. J. Robertson. "Regulating the flow of fluids." A communication.

The full Titles of the patents in the above List can be ascertained by referring back to their numbers in the Lists of Provisional Protections previously published.

Opposition can be entered to the granting of a Patent to any of the parties in the above List who have given notice of their intention to proceed, within twenty-one days from the date of the Gazette in which the notice appears, by leaving at the Commissioners' office particulars in writing of the objection to the application.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

1499. R. Muckelt.
1502. R. Tidmarsh.
1520. J. Beckett and W. Seed.

LIST OF SEALED PATENTS.

Sealed July 2nd, 1858.

17. J. Platt.
58. J. B. A. Couder.
86. V. de Tivoli.
106. W. White.
140. W. E. Newton.
144. J. and E. Harthan.
618. C. N. Kottula.
986. J. G. Appold.

Sealed July 6th, 1858.

22. J. D. Malcolm.
23. M. L. J. Lavater.
26. F. P. Cappon.
27. J. Reilly, jun.
29. R. and J. Philp.
34. P. Soames and J. C. Evans.
35. R. A. Brooman.
36. H. Atkins.
151. C. N. Kottula.
293. H. Wilde.
617. C. N. Kottula.
619. C. N. Kottula.
999. W. S. Hollands.
1013. W. E. Newton.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned above.

NOTICE TO CORRESPONDENTS.

Articles and Correspondence designed for insertion in the ensuing Numbers of the *Mechanics' Magazine* must reach the Office by the Tuesday of each week, at the latest. It is highly desirable that they should be forwarded earlier, if possible.

CONTENTS OF THIS NUMBER.

LONDON: Printed and Published by Richard Archibald Brooman, of 166, Fleet-street, in the City of London; Sold by A. and W. Galignani, Rue Vivienne, Paris; Hodges and Smith, Dublin; W. C. Campbell and Co., Hamburgh.

Mechanics' Magazine.

No. 1823.] SATURDAY, JULY 17, 1858. [PRICE 3D.

Edited by R. A. Brooman and E. J. Reed, 166, Fleet-street, London, E.C.

GRICE'S PATENT MACHINERY FOR MAKING BOLTS, RIVETS, &c.

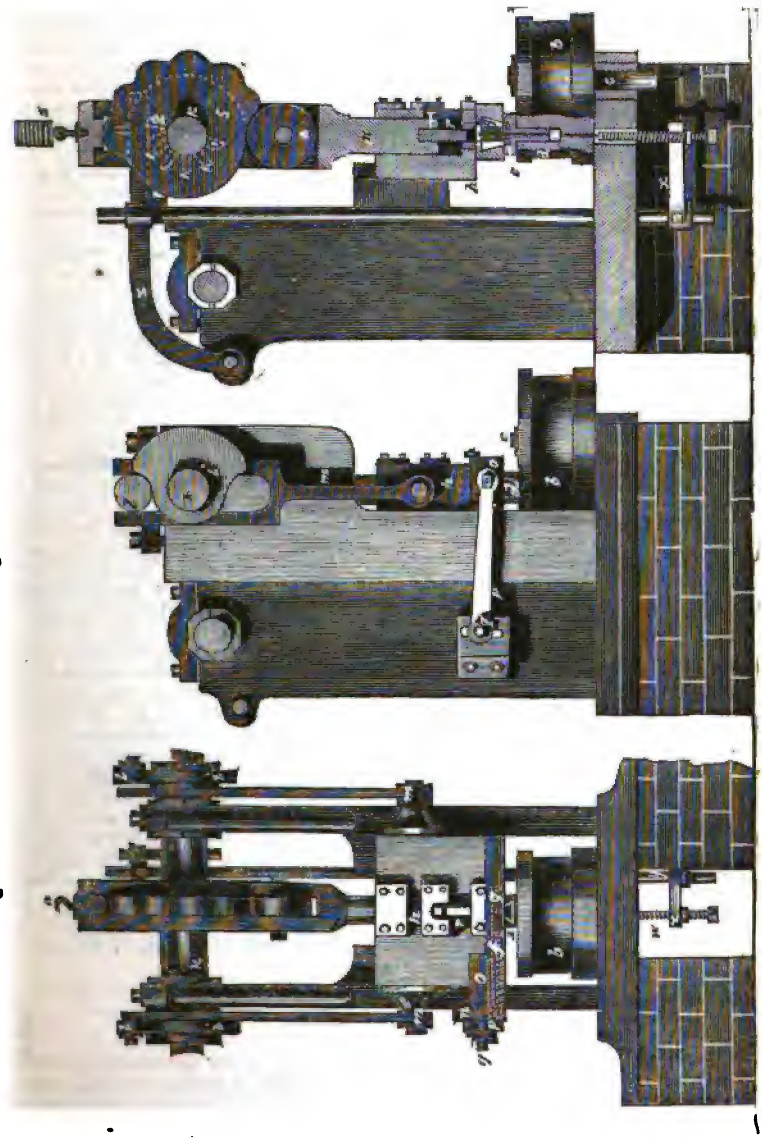


Fig. 3. Fig. 2. Fig. 1.

GRICE'S PATENT MACHINERY FOR MAKING BOLTS, RIVETS, &c.

Mr. F. G. Grice, manufacturer, of West Bromwich, Stafford, has patented the machinery hereafter described for the manufacture of bolts, spikes, rivets, screw blanks, and other articles made from rods of iron heated at one end. The machinery forms a head on the heated end of the iron rod, thereby converting it into a bolt, spike, or other like article.

Fig. 1 of the engravings on the preceding page represents the improved machinery in front elevation; fig. 2 is the same in side elevation; and fig. 3 a vertical section taken through the line *a*, fig. 1. *b* is a rotatory bed turning with an intermitting motion upon the axis, *c*. A number of dies, one of which is shown at *d*, are fixed in the rotatory bed, *b*. The rods to be headed are placed, with their heated ends uppermost, in the dies, *d*, and by the motion of the bed, *b*, the said rods are brought in succession under the operation of the heading tools. The finished bolts, spikes, or other articles are carried away by the rotation of the bed, *b*, and are removed from the dies, *d*, by a rod passing through the bottom of the dies, or in any other convenient manner. The heading of the heated rod, *e*, is effected in a pair of dies, *f*, *g*, which, when brought together, have internally the shape of the head to be made on the heated rod. The said dies, *f*, *g*, have a vertical sliding motion, being fixed to the slide, *h*, which is raised by the cams, *i*, on the driving shaft, *k*; the said cams, *i*, act on the rollers, *l*, *l*, and connecting rods, *m*, *m*, jointed to the slide, *h*. The descent of the slide, *h*, is effected by its own weight. The die, *f*, is kept to its bearing against the die, *g*, by means of a screw, *n*, passing through the screw box, *o*. The head of the screw, *n*, is fixed to the lever, *p*, which said lever turns upon a joint at *q*. As the slide, *h*, rises, there is a partial rotation of the screw, *n*, in its screw box, *o*. By the die, *f*, being no longer kept to its bearing against the die, *g*, the head of the bolt made in the dies, *f*, *g*, is no longer held tightly in the said dies, and they rise without carrying the bolt with them. As the slide, *h*, descends, the die, *f*, is again made to bear against the die, *g*, by the action of the screw, *n*. *r* is a plunger, which passes through a guide in the slide, *h*, and enters the cavity in the dies, *f*, *g*. The plunger, *r*, in its descent compresses the upper end of the heated rod, *e*, into the lower part of the cavity in the dies, *f*, *g*, and moulds the same into a head. The descent of the plunger, *r*, is effected by means of a cam, *s*, on the main shaft, *k*, the said cam, *s*, acting on the roller, *t*, fixed to the bolt, *u*, which carries the plunger, *r*. The figure of the cam, *s*, is such, that it does not force down the plunger, *r*, by a uniform motion, but communicates thereto a series of blows or impulses through the roller, *t*, so as to force the plunger, *r*, into the dies, *f*, *g*, with an intermitting motion somewhat resembling that which would be given to the plunger, *r*, if it were struck a series of blows with a hammer. The patentee causes the rod, *e*, to be lifted slightly in the mould after each blow of the plunger, *r*. This is effected in the following manner:—The rod, *e*, rests upon a moveable bottom, *v*, in the bed, *b*; a rod, *w*, passing up through the bed of the machine is made to lift the moveable bottom, *v*, by the following arrangement:—The rod, *w*, is screwed in an arm, *x*, on the lower end of a vertical rod, *y*; the rod, *y*, is connected with a lever, *z*, and the lever, *z*, is acted upon by a series of teeth on the main shaft, *k*, which teeth are indicated in dotted lines in fig. 3, and marked 1. By the rotation of the shaft, *k*, the teeth, 1, act upon the tooth, 2, on the lever, *z*, and raise the said lever, *z*, rod, *y*, arm, *x*, and rod, *w*; the motion of the latter raises the moveable bottom, *v*, and the rod of iron or bolt, *e*. The relative positions of the cam, *s*, and teeth, 1, are such, that the raising of the rod, *e*, is effected simultaneously with the ascending motion of the plunger, *r*. The ascent of the bolt, *u*, and plunger, *r*, is effected by a coiled spring, 3.

By the operations described, the heated top of the rod, *e*, is formed into a head, and on the ascent of the plunger, *r*, and slide, *h*, the headed rod, *e*, is left in the die, *d*, and is carried from under the heading mechanism by the motion of the bed, *b*. During the action of the machine a plentiful supply of water is introduced into the dies, *f*, *g*; the cooling action of the water, and the lifting of the heated rod in the dies by means of the teeth, 1, and rod, *w*, prevent the softening and cracking of the dies and plunger by which the head of the bolt is formed.

Preserving Stone and Iron.—We understand that the Government have commissioned Mr. Szerelmy, the inventor and patentee of a composition for preserving stone and iron from injury by atmospheric agency, to apply his material to such portions of the walls of the new Houses of Parliament as may require it.—*Times.*

REPEAL OF THE DUTY ON PAPER.

On Monday last an important meeting of the representatives of the London Press was held at Peele's Coffee House, Fleet-street, to consider the means which should be adopted in order to give effect to the recent resolution of the House of Commons on the Paper Duty, by obtaining its repeal. The meeting was convened by the Committee of the Association for the Repeal of the Taxes on Knowledge, and the purpose was to amalgamate with the newspaper press for the attainment of the objects of the Association.

Mr. Milner Gibson, M.P., occupied the chair, and there were present Mr. Clowes, Mr. Vizetelly, Mr. Cassell, Mr. H. G. Bohn, Mr. G. Routledge, Mr. Collett, Mr. S. C. Hall, Mr. B. Langley, Mr. F. Fowler, Mr. Francis, Mr. E. J. Reed, Mr. Petter, Mr. Levy, jun., Mr. J. P. Edwards, Mr. Harper, Mr. J. Hamilton, &c.

The Chairman having opened the meeting in the usual way,

Mr. Francis, of the *Athenæum*, reminded those present that ten years ago a number of gentlemen met in that very house to protest against the obnoxious paper duty, and the advertisement duty afterwards became strongly agitated. That impost was ultimately removed, with what benefit to the community he need hardly then state; it only remained for those who are determined in the same spirit as the gentlemen who formed that association, to stand by their purpose, and the repeal of the paper duty was a question of a very few months indeed. He trusted that they would all continue their efforts, and act upon the resolutions which would be submitted to them.

Mr. Cassell moved the first resolution, to the following effect: "That it is desirable that the members of the newspaper press make a vigorous effort to obtain the repeal of the paper duties in the ensuing session of Parliament." The speaker said that he had some experience of the question, having visited America and witnessed the working of the newspaper press in that country. The proprietors in England were at a great disadvantage as compared with their Transatlantic brethren, because in America the manufacturers of paper could go into the foreign markets of Europe and purchase up the material, take it home, and make paper of it, because there was no paper duty to pay. In consequence of the rise in paper of 2¼d. per lb., combined with the duty, it made upwards of £30 a-week difference to him upon one periodical alone; in fact, the periodical press was only saved on the occasion he alluded to by a large supply of very inferior paper which was obtained from abroad—Belgium. Every one must be alarmed at anything that could operate against the commercial success of the press of this country. He looked upon the repeal of the paper duty as a question fraught with the greatest advantage to the working classes. He found that even so apparently small a sum as 1s. a ream, with those publications whose weekly circulation was 100,000 and 200,000, was something enormous, supposing the ream to weigh 30lbs. or 40lbs. If such duty was in the hands of the proprietors, it would furnish them with ample means to employ the first talent in the literary world. Believing that the repeal of the paper duty would greatly benefit the mental condition of the people at large, he had much pleasure in submitting the resolution for their acceptance.

Mr. Clowes, in a few brief and energetic observations, seconded the motion of Mr. Cassell, and in doing so referred to his own personal experience of the evil of the paper impost.

Mr. H. G. Bohn, of York-street, Covent-garden, the eminent publisher, rose, and said, he was of opinion that a repeal of the paper duties would be injurious to the publishing trade. He referred to various countries where fibrous substances were to be found convertible into paper, but contended, if they were employed in a manner suitable for the purpose, their introduction would make paper no cheaper than at present, on account of the expense of shipment and other charges before they reached the manufacturer's hands. The paper makers of Europe had been trying for eight centuries to find a substance in lieu of linen that would answer the purpose, but such had never been discovered in sufficient quantities to make its importation worth while. The Americans had tried cotton, and had thrown it away because it did not answer; it wanted the linen element in it, without which any substance would be ineffectual. He contended that if the duty was taken off there would be a great rush for rags, and the paper makers and publishers of this country would not benefit, because all the available material would be bought up; of that he was quite satisfied. He had received a letter from Germany, stating that the paper makers there were brushing up their mills, and were contemplating sending over to this country to compete with the paper makers here.

The Chairman asked Mr. Bohn if, according to that line of argument, the Government was wrong in reducing the duty from 3d. to 1½d.

Mr. Bohn said, No; he thought 3d. was

an extravagant duty, but in the present instance he was willing to take a bet that after the repeal there would be a rise in the price of paper. Entertaining those views, he should enter his protest against any attempt at repealing the present duty. It would interfere with foreign commerce; and he held that anything which supported our foreign commerce also supported that at home.

Mr. Levy, publisher of the *Daily Telegraph*, supported the resolution on the ground that the repeal of the duty would enable publishers to provide increased remuneration for authors, and to improve the quality of the literature presented to the people.

Dr. Watts, of Manchester, addressed the meeting from the educational point of view, and contended that by the paper duty Government destroyed 25 per cent. of the school books that should be used in educating the rising generation of the country.

Mr. B. Langley, of the *Morning Star*, questioned Mr. Bohn's assertion about diminution in the supply of the raw material, and said they had no idea what an amount of straw could be brought into the market for manufacturing writing paper if the duty was repealed. Many other materials would be found in sufficient quantities to meet any demand.

Mr. Reed, of the *Mechanics' Magazine*, supported the resolution, and remarked that the arguments adduced by Mr. Bohn would not be listened to if employed in favour of the imposition of a new tax, and were too feeble to be opposed to the removal of an impost which had over and over again been proved extremely injurious to the public. He further remarked that the proper agency for meeting a demand for a manufactured article was the inventive skill of the people, and upon that we might securely rely in the present instance.

Mr. S. C. Hall gave his cordial support to the motion, and illustrated, by reference to the periodical with which he was connected, the injurious effects of the paper duty. He had conducted the *Art Journal* for ten years, and therefore could speak to the point. It had a large circulation, and in 1851 they paid £70,000 duty, and, notwithstanding its enormous sale, they lost more than £3,000 that year. He understood Mr. Bohn's objections well; many a good and expensive book which had never paid either author or publisher found its way to Mr. Bohn's bookshelves at a price which enabled him to make money, and which the repeal of the paper duty might seriously interfere with. Mr. Hall concluded a very able speech by urging all present not to relax their efforts until the paper tax was repealed.

The resolution was then put and carried unanimously.

Mr. F. T. Fowler, manager of the *Standard*, said, his opinions were now before the country, they having been fully stated to his friend the honourable member for Boston, who did him the honour to read his opinions in the House of Commons, when the right hon. chairman (Mr. Milner Gibson) brought forward his motion. He begged to deny in toto the assertion of Mr. Bohn, that, if the paper duty were repealed, the raw material of which it was made would increase in price, and thereby prevent anything like a saving. There were hundreds of materials that could be made into paper, but the present fiscal arrangements prevented the manufacturer from trying experiments, simply from the fact that, if he failed in his experiment, the entire loss would fall upon himself. The *Standard* of that day was printed upon paper prepared as an experiment that had turned out successful; but owing to the excise duties it had cost the manufacturer £7,000 before he could complete his experiment. He told Mr. Bohn that he looked upon him as the very broker of literature, for hundreds and thousands of works, as his friend Mr. Hall had testified, had found their way into his warehouse which never would have been in his establishment had there been no paper duty. The abolition of the paper duty would not only enable proprietors to give a better paper, but it would also enable them to pay adequate compensation to authors; and, as an illustration, he might refer to Mr. Routledge. On an average, the books published by that gentleman weighed at least half a pound each, the duty upon which was over a penny. Some of those works had a circulation of above 100,000. As every 1,000 pence was £4 3s. 4d., it was only right to suppose that nearly £500 was paid for duty. He (Mr. Fowler) did not know what Mr. Routledge paid for his authors, but he was quite certain that if the duty were abolished he might pay a considerable sum more than he did at present. Mr. Fowler concluded by moving: "That a committee be appointed to carry out the last resolution, and to co-operate with the association now working for the repeal of the paper duty."

Mr. Lucas seconded the resolution, and said that the very demand created would be met by inventive minds looking out for the discovery of new supplies.

Mr. Petter (Petter and Galpin) stated that *Cassell's Illustrated Family Paper* paid £7,000 duty every year.

Mr. Nott gave a very interesting account of the manufacture of paper from various substances; and after some further conversation the resolution was carried *nem. con.*

A resolution appointing a Committee was then moved, seconded, and carried.

Mr. Vizetelly alluded to the sinews of war, and put his name down for £10, Mr. Petter adding £10, and Mr. Levy £10.

A vote of thanks was unanimously passed to the Right Hon. T. Milner Gibson, M.P., the chairman, who, in returning thanks, intimated that, if a lively agitation were kept up till next year, Mr. Disraeli would get rid of the tax. The House of Commons had declared against it, and it was for the gentlemen present to see that their declaration did not remain a dead letter.

The meeting then terminated.

The Committee appointed afterwards met, and elected Mr. Cassell as their chairman, and Mr. Vizetelly as their Secretary, *pro tem.* They hold a business meeting this day, Saturday, July 17th.

THE SUPERANNUATION OF DOCKYARD OFFICERS.

In our last Number we concluded a short article upon Civil Service Superannuation by saying that, "after a careful perusal of the present and former Acts, and of the Reports of the Committee of the House of Commons and the Royal Commission, we are left in doubt whether working men and inferior officers (of the Royal Dockyards) are to participate in the benefits of the new Bill."

At the very time that our Magazine was at the press, Mr. Wilson asked the Chancellor of the Exchequer, in the House of Commons, whether in the terms of the Superannuation Bill, as then before the House, the officers of the dockyards were intended to be embraced in its provisions; and, if so, whether the entire period of their service would be included in computing their pensions, as recommended by the Royal Commission; and, also, whether it was intended to include the permanent day labourers.

Mr. Disraeli said in reply that if the hon. gentleman referred to the Bill he would find that by the second clause it was not to apply to appointments by Act of Parliament, by Order in Council, or by Royal Warrant. The dockyard officers and the day labourers held their appointments under an Order in Council, and therefore the Bill would not apply to them. If it was thought right to bring them within the Bill, by rescinding the Order in Council or by other means, the mode of computing their pensions would, of course, depend greatly upon the Board of Admiralty; but, so far as the Treasury was concerned, he should wish that their continuous service should be included,—of course with such conditions, and under such circumstances, as would make the Act fair to all parties.

Since the above questions were asked and answered, Mr. Wilson has given notice of his intention to move amendments upon the Bill of the Government when it is discussed in Committee, with the view of placing all the dockyard men and officers upon the same footing; and, judging as well from the general policy of the present Government as from the statements of Mr. Disraeli before given, we hope these amendments will be carried, since they entirely agree with the recommendation of the Royal Commission,—"To bring under the ordinary rules of superannuation"—we here quote the words of the Commissioners' Supplemental Report—"various offices and departments which have hitherto been treated as exceptional cases, *so as to secure, so far as may be practicable, a uniformity of system.*"

We add a word upon the importance of the subject to the parties concerned. A workman's superannuation, under the existing system, can never exceed £24 per annum, whatever the length of his service may be. A leading man's can never exceed £34. An inspector's, while it can never, under ordinary circumstances, rise very high, may absolutely fall considerably below what he was entitled to as a leading man! Under Mr. Disraeli's Act, a workman would be entitled to two-thirds of his annual income, after forty years' service, as a maximum; and leading men and inspectors would also be entitled to that proportion of their respective wages or salaries.

We see no reason whatever why the Government should not deepen their legitimate influence in the dockyard boroughs by rendering the men whom we have mentioned—who are thousands strong, and nearly all voters—this measure of justice.

Let them not be afraid of any extra burden of moment being brought thereby upon the State finances. Poor men stick to their work as long as they are able, and soon drop off when their toil is over. A hundred of them may be treated handsomely in their old days at less expense than one pensioner of certain classes which we will not name. We look confidently to Mr. Disraeli for another proof of his chivalric conservatism.

THE LONDON MECHANICS' INSTITUTION.

We have been requested to publish a communication which the Committee of Managers of the above Institution have prepared in reply to the Report of Dr. Lyon Playfair, which was ordered by the House of Commons to be printed (26th of March last), and noticed in the *Mechanics' Magazine*. We have not space for the entire communication, but present the following abstract of it:—

The committee admit that the financial difficulties of the institution have prevented it from continuing several classes requiring well-paid professors, and that the same cause has prevented the general character of its instruction being kept up to a due standard of efficiency. They intimate, however, that, even without money difficulties, the institution could not be expected to compete with university and collegiate institutions. They believe, nevertheless, that it may be made a good preparatory school for such higher institutions to those who have not had preparation at other establishments, or for adults, who would not wish to enter a youthful assembly ; and that hitherto it has met the wants of artizans, tradesmen, apprentices, clerks, and the great mass of the young men of London, who, unable to enter upon a thoroughly scholastic curriculum, may, at a small expense, pursue two or three branches of study, and thus secure at once the improvement of their minds, assistance in their business from the bearings of their study, and that advancement in social position which is almost inseparably connected with mental culture. The committee also consider, that, while provision is made for such studies as require great mental application, it is equally important that the wants of the large class whose daily avocations involve mental care and anxiety should be met by useful studies of a less severe kind—music, elocution, the various branches of drawing, &c. The same remark applies to the selection of lectures ; at the same time the most eminent literary and scientific men have been and are engaged for the lecture hall. The committee dissent from the Doctor's Report—that the classes of arithmetic, mathematics, book-keeping, chemistry, anatomy, landscape, architectural and mechanical drawing, and human-figure drawing, French, writing, and elocution, " show a proportion of light instruction to solid rarely to be found." On the contrary, they are of opinion that these classes are eminently solid, and more useful to those for whom they are designed than more difficult subjects implying greater previous attainments.

The building debt was, from the very commencement of the institution, £3,700; by the exertions of the committee of management it was reducedin 1842 to £2,350; interest for 3½ years in arrear to 1846, added to the principal, made the debt £2,655 10s. ; since which time, owing to the heavy rental of £229 per annum, it has accumulated to its present amount of £3,398 18s. It will thus be seen that the debt has scarcely increased from the foundation of the institution to the present time, notwithstanding the annual payment of 4 per cent. interest in addition to the heavy rental. Had the institution been free from debt at the outset, even at the end of the first twenty years the sum of £3,200, the amount paid for interest alone, would have been added to its funds.

Among the causes which have led to the decline of this institution, in common with others, the committee mention the following:—The alterations in the city and its neighbourhood, and the increased occupation of its houses for business only; the position of the institution, which lacks the attractions of buildings fronting the great public thoroughfares; and the competition arising from evening classes at colleges and governmental institutions for conveying high-class instruction at a small cost. Notwithstanding these, the value of the institution (which the committee even now believe to be the best of the kind in London) is unmistakeably shown by the large number of its members who come from great distances, many even from the outskirts of London, though other institutions may be at their very door.

It is felt that the just course now to pursue is — first, to insure vigorous management within; secondly, to call for the aid of all who feel an interest in the prosperity of the institution. The time has arrived when the institution, still resorted to by hundreds of persons, must, if it is to continue, be permanently placed on a sure footing, and, if this is done, it will insure enlarged results—results honourable to the individuals, and honourable to the city of the parent Mechanics' Institution.

The committee are not without numerous testimonies to the usefulness of the institution, and, if its doors should ever close, they cannot but believe that it has fulfilled its mission, and that the tens of thousands who have been its members show its influence to have been widely spread, and that it has borne no unimportant part in the education of the people. They believe that it now possesses the elements of strength and adaptability to the wants of the age, and that it is only necessary to assist its funds to allow it to develope them; that its downfall would be a great loss to the com-

munity, and, in the language of *The Times*, be "to the immense disgrace of the cause, to the great discouragement of science, and to the injury of the working classes;" that it is as easy, with properly remunerated teachers, to have classes in which principles are taught as those for mere practice, and that this is the element which must be at the base of all useful instruction. There is reason to believe, that, with a removal of its debt and its heavy rental, the institution would be rendered efficient, and at the same time solvent; and the committee appeal to all friends of education and kindred societies to assist their exertions to secure the help of the Government to prevent the parent institution of England from closing.

As a proof of the vitality still remaining in the institution, it may be observed that the members sent up by its local board of examiners to compete for the certificates and prizes of the Society of Arts were remarkably successful, and the proportion of certificates received by them to the members competing was such as to secure for the institution one out of the two prizes given by the Society to local boards.

THE ATLANTIC TELEGRAPH.

The following despatch was received on Tuesday by the *Times* from its own reporter, who, says the editor, "has been so unfortunate as to accompany the cable in its cruise on board the *Agamemnon*:"—

"Queenstown, Monday, July 12th.

"The *Agamemnon* arrived here this morning at 12·30, having left the rendezvous in the centre of the Atlantic on the 6th inst.

"On the voyage out with the other vessels of the squadron a succession of tremendous south-westerly gales was encountered, which scattered all the ships for some days.

"During this time the very heavy and unequal load on board the *Agamemnon* made her condition one of danger.

"At one time, indeed, the storm was so violent that the chances were strongly in favour of her going to the bottom with all on board.

"The worst storm was during the 20th and 21st of June, when the *Agamemnon* rolled so heavily and dangerously as in her then trim to lead to serious fears that the masts would go overboard, or that she would capsize completely and founder.

"In these heavy lurches the coals which were stowed in the main and lower decks broke away, and seriously injured several of the crew.

"The electric instruments were all injured. The main coal in the bottom of the hold shifted. The deck boats got adrift. The iron screw guard was wrenched in two, and the waste steam pipe between the boilers broken, all by the heavy rolling.

"Twice, after every effort had been made to ease the ship, which was much hampered by the upper deck coil of 236 tons forward, it was found necessary to run before the wind, so that it was only on the 25th of June that the rendezvous was made, and the other vessels of the squadron sighted.

"The first splice was made on the 26th, and was broken an hour afterwards on board the *Niagara*, after three miles had been paid out from each vessel. The second splice was also made on the 26th, and broke at 4 a.m. on the morning of Thursday, the 27th, parting apparently at the bottom of the sea, after some miles had been made from each ship.

"The third and last splice parted at 10·30 p.m. on the night of the 29th, about six fathoms below the stern of the *Agamemnon*, after 146 miles had been paid out of that vessel.

"The cause of the last fracture is not known, as the strain of the wire was only 2,200lbs.

"After this the *Agamemnon* returned to the rendezvous, and cruised for five days, during which she met with sufficient bad weather to prove that the removal of the upper deck coil had almost restored her to her trim, and certainly rendered her buoyant on a sea.

"Unfortunately, the *Niagara* did not return to the rendezvous, so that the only fine weather which the expedition had was totally lost, and the *Agamemnon* had to proceed to Queenstown.

"There are still 2,500 miles of wire on board the two ships. It is intended to fill up with coal and fresh provisions, and start for a final attempt on Saturday next."

The communications hitherto received by ourselves from on board the *Agamemnon* are to the same effect as the above despatch.

We do not, all things considered, think the "final attempt" which is contemplated altogether undesirable, although we are certainly not sanguine enough to hope for a successful result.

The *Cork Examiner* says:—"The examination of the broken end that was made on board (the *Agamemnon*) did not show that any flaw or weakness existed where the breakage occurred, and the only probable cause that can as yet be assigned for the accident is a sudden jerk which might have taken place, and which might have snapped the cable before the dynamometer had time to indicate the additional strain."

THE SEWAGE QUESTION.

The *South London Journal*, one of the most ably conducted and, therefore, one of the most influential local newspapers in the metropolis, in the Number of July the 6th, published the following paragraph :—

"The views which will be found adopted in our editorial articles of this week on the Main Drainage question have unexpectedly received a very striking confirmation by the results of certain appropriate experiments of a most unequivocal character, detailed in a pamphlet which has just reached our hands, written by Messrs. Benjamin Young and Peter Brown, of Spa-road, Bermondsey, entitled, 'The Sewage Question, and the State of the River Thames.' The authors of this very sensible pamphlet remove the subject at once from the regions of mere speculative reasoning, and bring their own practical experience to bear on the question, and anything more decisive or encouraging can hardly be conceived. We have here an amount of common-sense which has not often been bestowed on this imperfectly understood problem. The authors prove, to an extent which seems to us sufficiently clear to satisfy all reasonable minds, that the sewage of the Thames can be almost entirely defecated by mere mechanical deposit, while the noxious gases which are produced in the sewage reservoirs during the sedimentary process can be disposed of by the action of fire. These reservoirs can be made so innoxious that they may be placed comparatively near London, and the deposit will be so slight that they will only need emptying once in twelve months. The sediment will then require to be deodorised, and its value for agricultural purposes, at the very moderate estimate of 5s. per ton, will be £200,000 per annum. The sewage is to be conveyed to the reservoirs by intercepting sewers, the latter to consist of cast-iron culverts laid at low-water mark on each side of the Thames. Further details are given, to which we need not now refer; but we may add that the estimate for the works thus proposed for collecting and disposing of the sewage is about a million and a half sterling, and the plan is so simple, that we cannot see why this moderate figure need be viewed with any strong suspicion. Of all the plans that have been laid before the public, we can conscientiously say that not one has ever appeared to us so entirely satisfactory as this which has just come before us; and we feel the more confidence in recommending it to the favourable notice of the public, and of the authorities concerned, because the reasoning is not based on theory, but on fact, and is supported by practical experience."

In the Number of the same Journal of Tuesday last, a leading article renews the subject, concluding with the following observations:—"The Bermondsey plan to which we have alluded proposes the intercepting of the sewage at the banks of the Thames, so that the existing sewers will not be interfered with, house-drainage may go on uninterruptedly, our streets need not be broken up, nor our houses brought down about our ears. There need be no tunnelling, no lapse of years in constructing large subterranean channels, but two single iron culverts laid on the banks of the Thames at low-water mark, one on each side of the river, and carried down a moderate distance, discharging their constantly flowing contents into a covered tank on each side, whence the sewage will be lifted by steam pumps into spacious covered reservoirs, where the insoluble sewage may settle, while the gases are drawn off and burned, so that no nuisance would be occasioned to the neighbourhood. On each side of the river would be seven of these covered reservoirs, each capable of taking a day's discharge from one culvert. Each reservoir would have a week for settling, and every day one reservoir out of the seven would have the clear, inodorous, supernatant fluid allowed to run off into the Thames, either direct or by iron pipes to a remote point, if thought necessary. All the horrors of absolute sewage tumbling *en masse* into the river, all the expense of gigantic brickwork sewers and remote outfalls, all the delay of tremendous masonry works, all the expense of precipitating by lime (as at Leicester), would be avoided. Once a year, at the most suitable season, the pits would be emptied of their solid contents, the deposit deodorised, and, if found unsaleable, either given away or thrown away. What simpler, quicker plan can be devised? What have we to wait for? Why should not Parliament sanction such a scheme, and why should it not be complete in two years? The Metropolitan Board ask five years for their plan, although their Act of Parliament requires them to dispollute the river by December 31, 1860."

WOOLWICH ORDNANCE AFFAIRS.

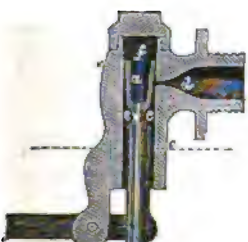
Six iron guns, the first and only production of the Royal Standard Foundry, erected at Woolwich during the Russian war, were yesterday fired at the proof butt at 1 p.m., and they passed through the two rounds with perfect satisfaction. It was announced that exertions were being made to bring some others forward for trial, but

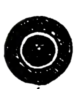
only six were then produced. It is asserted that, although a return of the expenditure has been repeatedly called for, no account has up to the present moment been obtained, and that under the existing arrangements some indefinite delay has been asked and partially granted. During the administration of the late Government, the visits of Lord Panmure and Mr. Monsell to the departments of the Royal Arsenal were of frequent occurrence, and matters requiring the eye of the chief were examined with rigid scrutiny. Although one of the most important branches of Her Majesty's service, the present Secretary of State for the War Department has not up to the present moment paid his first visit of office. A number of barges arrived at the Royal Arsenal pier during the latter part of last week, and landed cargoes of guns of the calibre of 8, 10, and 11 inches from the various contractors, and the steamship *Contest* yesterday landed a cargo of similar calibre from Goole.—*Times*, July 13.

PARSONS AND ATTREE'S PATENT TAP AND FLUSHING APPARATUS.

MESSRS. PARSONS AND ATTREE, of Brighton, engineers, have patented the following improved cock or tap and flushing apparatus. The invention, so far as it relates to the cock, is illustrated in fig. 1 of the annexed engravings, and consists in forming the plug in the shape of a hollow cone or tapered figure, *a*, and with apertures, *b*, shown in dotted lines, for the outflow of water at the back of the cone. The plug is free to move up and down within certain

Fig. 1. Fig. 2.

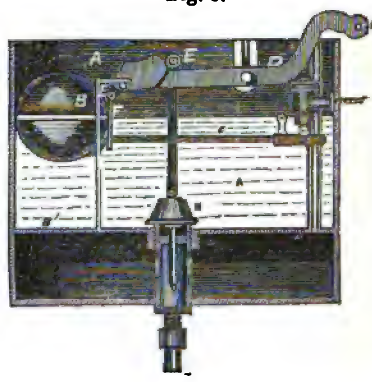




limits in a hollow barrel, *c*, closed at the upper end and open at the lower, to allow of the passage of liquid through it. The water enters the barrel, *c*, through an orifice, *d*, in the upper part thereof, which is formed conical at that part, and affords a seat for the hollow plug, *a*. In order to admit liquid, the hollow plug is forced up, when the liquid will flow in through the orifice, *d*, in the barrel. To stop the inflow, the plug is drawn downward into its seat, and closes the aperture, *d*, in the barrel. The spaces, *e*, *e*, between the triangular faces of the lower end of the plug, shown separately and in section in fig. 2, allow of the passage of any liquid there may be in the barrel and at the back of or within the hollow portion, *f*, of the plug.

The flushing apparatus is constructed by preference as follows:—The patentees fit such a tap as that before described inside a cistern, A, shown in section in fig. 3, and connect a float or ball, B, on the end of a rod, C, to the outer end of the plug, *a*. A lever, D, supported in bearings at the sides of the cistern, A, carries at or near its extremity a second lever, E, to the outer end of which a hook, F, is attached. This hook, as the lever, E, is raised, takes hold of the rod, C, and raises the ball. The lever, E, to which the float rod is connected, is centred upon the inner end of the lever, D, and the outer end of the lever, D, has a wire or pull attached to it at G. The outflow valve, H, is also connected to the lever E in such manner,

Fig. 3.



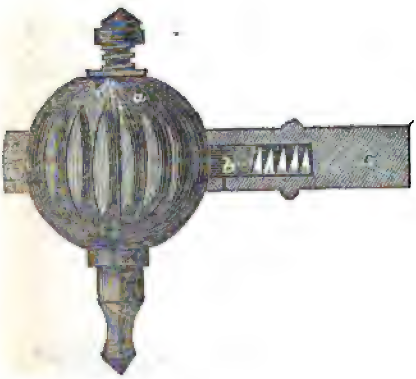
that, upon the commanding wire being pulled, the float, B, is first raised to the position shown in the drawing, in order to close and to keep closed the inlet; the outlet valve, H, is immediately afterwards raised, by continuing the pull, to permit of the discharge of the whole contents of the cistern; on releasing the commanding wire, the outlet valve, H, falls, and the float, B, also falls, and allows of water entering the cistern to the height regulated by the ordinary action of the float.

In order to improve the flushing action of the apparatus, they prefer to form the cistern with an inner bottom, B′, above the other, as shown in fig. 3. The space between

the two bottoms becomes filled when the outlet valve, H, is opened, and thus a sufficient outflow of water is secured.

EASTERBROOK AND ALLCARD'S PATENT RATCHET BRACE.

The accompanying engraving represents a ratchet brace which has been patented by Messrs. Easterbrook and Allcard, of Sheffield, and is in great request, being well adapted for heavy work. *a* is a spherical ball having grooves or notches ver-



tically around it for the tooth or paul, *b*, to take into. This tooth or paul, *b*, is kept in position by a spring, as shown. The usefulness of this tool is self-evident, as it can be worked at almost any angle, thereby facilitating the work of the mechanic considerably. It is manufactured at a small cost, and can therefore be supplied at a low price, and there is little liability of its getting out of order.

ROTATION PRODUCED BY ELECTRICITY.

At a recent meeting of the Royal Society an ingenious and curious apparatus was exhibited, displaying the rotation of a metallic sphere by electricity. The apparatus was contrived by Mr. Gore, of Birmingham, who states that his experiments had their origin in a phenomenon observed by Mr. Fearn, of Birmingham, in his electro-gilding establishment—that a tube of brass half-an-inch in diameter and 4 feet long, placed upon two horizontal and parallel brass tubes, 1 inch in diameter and 9 feet long, and at right angles to them, and the latter connected with a strong voltaic battery consisting of from 2 to 20 pairs of large zinc and carbon elements, the transverse tube immediately began to vibrate, and, finally, to roll upon the others. Acting upon this, Mr. Gore constructed a disc of wood provided with two brass rails, level, uniform, and equidistant; on these rails a hollow and very thin copper ball was placed, and, the brass rails being connected with a zinc and carbon battery, the ball began to vibrate, and presently to revolve. In all cases yet observed, Mr. Gore states that the motion of the ball is attended by a peculiar crackling sound at the points of contact, and by heating of the rolling metal. When the apparatus was exhibited before the Royal Society, electric sparks were seen as the ball rolled from the spectator. —*Athenæum.*

PATENT FEES AND THE PATENT MUSEUM.

On the vote of £26,198 being moved in the House of Commons, on Tuesday last, to defray the expenses of the Patent-office,

Mr. Williams complained of the extravagant fees payable to the law officers of the Crown in England, amounting on the whole to £8,500 per annum, while the Attorney-General for Ireland obtained only £1,200, and the Lord-Advocate for Scotland £850. It had been estimated that the sum derived by the Attorney and Solicitor Generals for England from their offices under the Crown and from their private practice was about equal to the salaries of three of our learned judges, or three Secretaries of State, including the Prime Minister. Their duties in connexion with the Patent-office were of the most trivial description, and might easily be discharged by a clerk. It ought to be remembered, too, that the persons who paid the fees, whatever their abilities might be, were generally very poor. He moved that the vote should be reduced by the sum of £4,000.

Mr. Walpole reminded the hon. member for Lambeth of what took place in 1852. A Bill was introduced in that year by which the patent law was materially altered, and he was credibly informed that the cost of patents was reduced by that measure from £500 to £50 or £60, as an ordinary average. There were no two men in the kingdom who did more work than the Attorney and Solicitor Generals for England.

Mr. Gilpin advocated the payment of all officers of the Government by fixed salaries, but recommended the hon. member for Lambeth not to divide the Committee upon this vote.

Sir G. C. Lewis did not understand that these fees were intended as a general retainer, but only as remuneration for the special services rendered with respect to patents. Unless it could be shown that they afforded only an adequate remunera-

tion for the services so rendered, the matter ought to be reconsidered.

The Solicitor-General reminded the Committee that out of these fees the law officers had to provide chambers and clerks for the transaction of their business. Each of them had to examine from twenty to thirty patents a-week, and of these generally nine or ten were returned because they were irregular, or contained claims which the Crown could not properly allow. The discharge of these duties occupied time during which the law officers might earn larger emoluments than they received for this service, and their neglect would produce much injury to trade, commerce, and manufactures.

After a little further conversation,

The Attorney-General, in reference to an observation of the right hon. member for Radnor, assured the Committee that no part of the duties of the Attorney or Solicitor General was performed by deputy. With respect to the fees, he could also state, that, in consequence of the difference that existed between the fees paid by the Crown and those paid by individuals, the acceptance of office was productive of loss rather than of increased emoluments.

The amendment was then negatived without a division.

Mr. Wilson drew the attention of the Government to the circumstance that the amount received from stamps upon patents last year was £88,860, while the whole expense of the Patent Department was only £46,840, and therefore suggested that the amount of stamp duties levied upon patents should be reconsidered.

The Chancellor of the Exchequer said, the whole of the stamp duties would probably be reconsidered next year, and the subject referred to by the hon. gentleman would not be omitted.

Mr. A. Smith wished for information respecting the sum of £1,500 required for the Museum of Patented Inventions at Kensington, and the further sums of £580 for the salaries of a curator, secretary, and assistant. He should move to reduce the vote by £2,000.

The Solicitor-General explained that there was formerly a Museum of Patents in Chancery-lane, containing a number of valuable and most useful models and a library, which were of great assistance to inventors. The space being small and the situation inconvenient, it became necessary to remove the museum, and accommodation was offered at Kensington. After some time the space at Kensington was required for other purposes; but the Commissioners offered to allow the Patent Museum to remain if the Government would expend a small sum in providing a building for the reception of the models and library. That arrangement was agreed to, and the present vote was the necessary consequence.

Mr. Dillwyn admitted the value of the museum, but thought Kensington a most inconvenient locality for it. (Hear, hear.)

The Solicitor-General said, that point had been considered, and the present arrangement was only temporary.

The Chancellor of the Exchequer said, the Museum of Patents had not necessarily any connexion with the museum at Kensington. At the present moment plans were before the Treasury for transferring the Patent Museum to quite a different quarter of London.

The amendment was negatived, and the vote was then agreed to.

INSTITUTION OF CIVIL ENGINEERS.

The Council of the Institution of Civil Engineers have just awarded the following premiums for Papers read at the meetings during the past session:—

1. A Telford Medal, to J. A. Longridge, M. Inst. C.E., and a Council Premium of Books, to C. H. Brooks, for their paper "On submerging telegraph cables." 2. A Telford Medal, to G. Robertson, Assoc. Inst. C.E., for his paper on "Hydraulic mortar." 3. A Telford Medal, to J. Henderson, Assoc. Inst. C.E., for his paper on "Dressing tin and copper ores." 4. A Telford Medal, to R. J. Hood, M. Inst. C.E., for his paper on "Railway stations." 5. A Telford Medal, to Major-General G. B. Tremenheere, Assoc. Inst. C.E., for his paper "On public works in the Bengal Presidency." 6. A Telford Medal, to A. Giles, M. Inst. C.E., for his paper on the "Southampton Docks." 7. A Watt Medal, and the Manby Premium, to G. L. Molesworth, Assoc. Inst. C.E., for his paper "On the conversion of wood by machinery." 8. A Watt Medal, to T. S. Sawyer, for his paper on "Tools employed in the manufacture of engines, steam boilers," &c. 9. A Council Premium of Books, suitably bound and inscribed, to F. C. Webb, Assoc. Inst. C.E., for his paper on "Paying out and repairing submarine telegraph cables." 10. A Council Premium of Books, bound and inscribed, to H. Conybeare, M. Inst. C.E., for his "Description of works recently executed for the water supply of Bombay, in the East Indies." 11. A Council Premium of Books, bound and inscribed, to S. A. Varley, for his paper on the "Submarine cable," &c. 12. A Council Premium of Books, bound and inscribed, to R. C. Despard, for his paper on "The river Lee, with remarks on the position of canals generally." 13. A Council Premium of Books, bound and inscribed, to A. Wright, Assoc. Inst. C.E., for his paper "On lighting mines by gas." 14. A Council Premium of Books, bound and inscribed, to J. Brunlees, M. Inst. C.E., for his description of the "Iron viaducts" across the Estuaries in Morecambe Bay, for the Ulverstone and Lancaster Railway.

It may be mentioned, that two of these awards, the Watt Medal and the Manby Premium, are now presented for the first time. The former originated with the Council, who were desirous of possessing some distinctive means of rewarding excellence in communications upon mechanical subjects. The medal has been executed by Mr. Joseph S. Wyon. On the obverse is a beautifully executed medallion likeness

of James Watt, and on the reverse a representation of the steam engine, as constructed by him. The Manby Premium is due to the liberality of Mr. Charles Manby, F.R.S., who has filled the office of Secretary for the last nineteen years, and with so much satisfaction to the members, that, a few months back, they presented him with a clock and candelabra, and a cheque for £2,000. In acknowledging this handsome testimonial, Mr. Manby requested that the Council would receive debenture stock of the value of £200, bearing 5 per cent. interest, to be expended in an annual premium. In accepting this offer, it was resolved that the premium in question should bear the title of the "Manby Premium."

SOCIETY OF ARTS.

The Council of this Society have awarded to Mr. W. Williams, for his "Machine for cutting and dressing stones for building purposes," the Society's *silver medal*. To Mr. J. W. Wilson, for his "Combination of the tubular gouge and disc-paring tool for wood-shaping machinery,"—*silver medal*. To Dr. J. Forbes Watson, for his paper on the "Food grains of India,"—*silver medal*. To Mr. J. Underwood, for his paper on "Writing, printing, and copying inks," &c. —*silver medal*. To Mr. J. A. Clarke, for his essay "On the application of steam power to the cultivation of the soil,"—*silver medal*. To Mr. W. Stones, for his paper "On New Zealand,"—*silver medal*. To Mr. A. G. Findlay, for his paper on the "English lighthouse system," — *silver medal*. To Mr. F. R. De la Tréhonnais, for his paper on "French Agriculture,"—*silver medal*. To Professor J. Wilson, F.R.S.E., for his paper "On Canada,"—*silver medal*.

METHOD OF MANUFACTURING STRONG CANNON.

Captain T. A. Blakely, of the Royal Artillery, with whose name and writings our readers are familiar, has just published an interesting pamphlet on the above subject,* advocating the construction of cannon by shrinking a series of concentric tubes one upon the other, or by winding wire round a central tube. As these modes of construction have been thoroughly discussed in our pages by ourselves, the author himself, and other correspondents, we need not here enter upon them. The following are the remarks with which the pamphlet concludes:—

"In consequence of the wonderful endurance of my 9-pounder, the British Government is now trying experiments with an 8 and a 10 inch gun of the same construction. It is expected that an 87 cwt. 10-inch gun can be made capable of firing solid shot of 130 pounds. For this purpose the metal should have been distributed differently, a greater thickness being given to the breech end: however, I anticipate a successful result even from the gun now at Woolwich on the pattern of the ordinary shell gun.

"As an experiment a 10-inch gun is quite large enough, and for all combats between ships as at present built, I think 8 or 9 inch shells will be more effective than larger ones; *but for some FEW purposes monster howitzers would be most useful*—in the bombardment of a maritime fortress from the sea, for instance, or for the protection of the entrance to a river or harbour.

"Although by doing so I must provoke ridicule, I feel it my duty to record my firm conviction that there is not the slightest difficulty in manufacturing cannon large enough and strong enough to throw shells of five tons five miles. We *have made* cylinders which *have borne* the full shock of the explosion of gunpowder almost hermetically confined in them. A greater strain than this cannot be caused by firing a shell of any size, if gunpowder be used.

"I have but a very faint hope that the truth of this will be acknowledged; but, knowing it, my duty is plain. I must and do warn England that guns can be made capable of bombarding Portsmouth from such a distance that the vessels carrying them could scarcely be seen from the shore. Since the discovery of the method of making such guns, the chance of an enemy having the command of the Channel for a few hours even has become a matter of some importance."

* A Cheap and Simple Method of Manufacturing Strong Cannon. By T. A. Blakely, Captain H.P. Royal Artillery, M.R.I.A., &c., &c. London: J. Ridgway, Piccadilly, 1858.

DAMPER FOR LABELS AND STAMPS.

Messrs. Schäfer, of Brewer-street, Golden-square, have lately produced, under the protection of a patent, a companion to the library and writing table, which supplies one of the best and most simple means of damping postage and receipt stamps which have as yet appeared. Its form is that of a massive glass inkstand, the lid of which has a hinge-spring which, when not clasped, keeps it sufficiently open to permit of the introduction of the postage stamps. Two pads, one within the lid and another

fitted into the neck of the bottle, are brought into contact by the pressure of the finger upon the lid, which opens again to receive another stamp. The moisture is supplied to the pads by capillary attraction, a piece of cotton, after the manner of the common lamp wick, affording just sufficient dampness to *both sides* of the stamp to prevent the latter curling up when laid upon the envelope or other paper. It is obvious that such a contrivance offers every opportunity for the exercise of taste and elegance, and an adaptation of form in unison with the surrounding adjuncts of a well-appointed escritoire.

TELEGRAPHIC COMMUNICATION WITH INDIA.

Mr. Brady asked, in the House of Commons on Monday last, whether it was the intention of the Government to take into its consideration the proposition of establishing a submarine telegraphic line of communication, as suggested by Mr. Serjeant Glover and sanctioned by concessions from the Governments of neighbouring States, from Plymouth to Cape Rocco, near Lisbon, thence to Gibraltar and Malta, where it will join the established line from Malta to Corfu, *en route* to India.

The Chancellor of the Exchequer replied, that it was not the intention of the Government to take the proposition in question into consideration. Their arrangements were already made, and they thought them preferable to the scheme suggested by the hon. member.

The above plan was not, it will be observed, that of the Great Indian Submarine Telegraph Company. Whether that is the one adopted by the Government we have not yet learned.

DRAKE'S LONG-RANGE DUPLEX BREECH-LOADING CANNON.

Gentlemen,—I am indebted to your correspondents who have taken an interest in my duplex breech-gun, which you did me the favour to publish in No. 1779; and I am happy in being in a position to state, no ostensible objection has been made at any time against the principle on which it is invented.

It appears to me that I am called upon to explain what has since transpired between the Government and myself in reference to that gun.

Without consulting me, or seeking better information than was given with the publication, Lord Panmure sent it to be reported upon by the Select Committee at Woolwich, whose report was quite in keeping with the way inventions are disposed of when not intended to be acted upon, and to prevent the charge of neglect.

This I quickly comprehended, having had in my time much experience of the "*burking*" system; and rather a strong but respectful correspondence followed, when I was told, even if a gun was made at my expense, it should not have a trial.

My sense of public duty commanded me, and those only who know what it is to experience *irresponsible* opposition from England's political party Government can comprehend the painful injustice which the unfortunate inventor for the public service of the country is subjected to if he dares not submit, without complaint, to the absolute power with which the various branches of the Government are invested. But, I am bound in justice to say, the retired Minister at War, who acknowledged the receipt of all the numbers of the *Mechanics' Magazine*, which I frankly sent him in reference to Ordnance improvements, gave me grounds to hope that a trial would have been made by the Government subsequently to the report, had he remained in office.

Lord Panmure's successor, General Peel, has had his attention called to that gun and my correspondence, and the Lord Privy Seal, the Right Hon. Admiral the Earl of Hardwicke, who takes great interest in gun improvement, assures me that he will attend in person to witness experiments if made, that he may be able to judge of its worth.

As General Peel assumes high responsibility, he may see fit to order an experiment without consulting Woolwich authority farther; seeing, as he must, the advantages of a gun that can be fired with safety from four to six as frequently as the common gun of the service, and with the same number of men or less, dependent on the mounting.

I have been made acquainted with the fact to which your correspondent calls attention in No. 1822, page 38, relative to experiments now making in America on my invention, which you made public twelve months since; but I am not inclined to take it for granted that, with a four-charge breech, sixty rounds per minute can be fired by electricity, and that thirty have been fired as stated.

I know enough of artillery practice and mechanics to sustain my assertion as to six, and no Artillery officer can be blind to its advantages for ship or land purposes; and, as before remarked, although the President of the Committee—the late General Chalmers—made so weak an objection to direct

breech-loading cannon as he did when Dr. Drake and self attended the Committee in 1854, I believe he would have reported to the War Department favourably of the gun in question, seeing that his objection was overruled by the *solidity* of the breech, which made it one and the same in principle as the gun in general use.

Before that report could be made, Mr. Eastman's American gun was selected by a sub-Committee without my knowledge; and, painful as it may be to know how the service had been deprived of a better plan and public money wasted, I have confined my attention to my own production, and still hope its national value will not permit it to be "sunk in the waters of Lethe" with its more favoured American competitor.

Hard as it may be to be so treated, I have not lost sight of the public good; and my letters will show how anxious I have been to discharge my duty without seeking favour in return; and all I desire is, that the Minister at War will look to the interest of the public service only in ordering experiments to be made with this or any other gun to which it may be proper in me to call his attention.

I am, Gentlemen, yours, &c.,
JOHN POAD DRAKE.

July 12th, 1858.

INSTANTANEOUS PHOTOGRAPHY.

GENTLEMEN,—Having frequently been asked by photographers what length of exposure I gave certain of my instantaneous stereos, and not being able, from sheer ignorance of the matter, to give a satisfactory reply, I take the liberty of enclosing a photo-stereo of an ascending 13-inch shell, taken by me at the mortar battery on Woolwich Common on the morning of the 28th ult., in the hope that by the following description of it some of your readers will be able to inform me of some rule practically available for calculating the time a given projectile would occupy in traversing a given space in any part of its parabola, when fired from a mortar at an angle of 45 degrees. The mortar when the stereo was taken was distant from the camera 30 yards, and the flagstaff, just perceptible to the right of the smoke, was distant 600 yards from the mortar. The 13-inch shell, weighing 200 lbs., was 10 seconds in traversing the 600 yards, and fell within six feet of the flagstaff. The dark track of the shell is seen to commence above the smoke, at about 18 of the shell's diameters from the mortar (perpendicular measurement), and extends 5 of the shell's diameters. Briefly, the shell when the exposure commenced was 30 feet from the mortar, and had traversed an additional 8 feet when the exposure concluded. What time did the exposure last?

I am, Gentlemen, yours, &c.,
THOMAS SKAIFE.

Vanbrugh House, Blackheath,
11th July, 1858.

[We do not see any method of solving Mr. Skaife's problem except by an appeal to experiments, which might be made with paper screens, as used by Mr. Whitworth in his investigations, and by others. The quantities given in the above letter do not afford sufficient data, of the right kind, for solving the problem theoretically. —Eds. M. M.]

SPECIFICATIONS OF PATENTS RECENTLY FILED.

WAY, J. T. *Improvements in obtaining light by electricity.* Dated Nov. 10, 1857. (No. 2841.)

One part of this invention consists in so arranging the charcoal forming the solid electrode that it shall be continually renewed and presented to a stream of a flowing electrode, at a constant distance from the orifice of the jet from which the latter issues.

HARRINGTON, J. *Improvements in apparatus for pointing pencils or marking instruments.* Dated Nov. 10, 1857. (No. 2842.)

The cutters or cutting edges used are made upon a sheet of metal, and each sheet has several slits formed through it, and the sides of each slit are made sharp. Such sheets are then bent into a cylindrical form, with the sharp edges inside, and attached to suitable holders.

BARTLETT, H. C. *Improvements in the manufacture of paper.* Dated Nov. 10, 1857. (No. 2843.)

This consists in adding to the paper pulp wheat, rice, potato, or other starch, which is mixed with the paper pulp without previously dissolving the starch or bursting the starch globules by the application of hot water.

THOMPSON, H. and S. *Improvements in the construction of pianofortes.* Dated Nov. 11, 1857. (No. 2844.)

These are applicable to all kinds of pianofortes, and consist in enabling the performer to produce an octave or chord at will by merely striking a single key. This effect is produced by applying to each key mechanism so constructed as to strike the octave or chord above or below simultaneously with the note answering to the key which has been struck.

MADDEN, P. *Improvements in kilns for drying corn, malt, or other granular substances, part of these improvements being applicable to the screening or sifting of such substances during the process of drying.* Dated Nov. 11, 1857. (No. 2845.)

This consists, 1. In causing the grain to descend, in strata, between inclined planes. Each inclined plane has beneath it a chamber or flue, for supplying heated air, which shall ascend through the strata of grain. The upper and lower sides of each incline are to be composed of wire work or perforated plates. 2. The sections of the kiln have chambers or flues over each other, containing the grain, for effecting the free evaporation of the moist vapour arising from the grain during the drying.

COCHRANE, J. R. *Improvements in the treatment or manufacture of ornamental fabrics.* Dated Nov. 11, 1857. (No. 2846.)

This refers to mechanical arrangements to be used for cutting and removing the loose or flushed threads of lappet fabrics, and particularly to an invention of the patentee dated 12th May, 1857, and it consists in the application to such machinery of a cutter of rotary action, for the severance of such loose threads as may have been left unremoved from the surface of the fabric, after quitting the primary reciprocating cutter.

WAHL, O. W. *Improvements in manufacturing farinaceous products from potatoes.* (A communication.) Dated Nov. 11, 1857. (No. 2847.)

The potatoes are first grated or rasped, and the pulp, with water, is continuously carried up by buckets of gutta percha or endless bands, in order constantly to supply a cylindrical sieve of wire-cloth, in an inclined position. Within this sieve an axle with brushes constantly revolves. Below the sieve is a second flat fine sieve of silk, which is kept constantly shaken, and below this there are separate vessels. The products, having passed in succession through the sieves, fall into these vessels.

TAYLOR, I. *Improvements in apparatus used in printing calico and other fabrics when cylinders are employed.* Dated Nov. 11, 1857. (No. 2848.)

This consists in employing a spindle so much smaller than the interior of the shell or roller (which is placed thereon), that the spindle may be deflected or bent when under pressure in the printing machine, without bending the roller or shell placed thereon, and this is accomplished by having adjustable bearings with curved surfaces on the spindle, such bearings being capable of being fixed nearer to or further from each other.

DAVIS, A. J. *A protective sandal for bathers, which may also be adapted as an auxiliary for swimmers.* Dated Nov. 11, 1857. (No. 2850.)

This consists of a sandal formed of a sole and a heel piece of gutta percha, to which are attached straps of vulcanised caoutchouc, for securing them to the wearer, whose foot is thus protected. The sandal may also be so modified as to form an auxiliary for swimmers.

WILLIAMS, J. *An improvement in coupling and connecting carriages on railways.* Dated Nov. 11, 1857. (No. 2851.)

This consists in the use of two supplementary draw bars or equivalents thereto (in addition to each ordinary draw bar), to be connected, by preference, to the same draw spring as is employed with the regular draw bar, or to a separate spring if desired. Side couplings or safety chains are employed, and are connected to the supplementary draw bars, and in these chains less slack should be allowed than is customary in the safety chains as ordinarily employed.

COLEMAN, E. *An improvement in lathes for turning bolts, screws, and other small articles in metal.* Dated Nov. 12, 1857. (No. 2852.)

This consists of a spring chuck, for holding the bolt, screw, or other article to be turned, which is so constructed as to allow of the article being removed and another substituted without stopping the revolution of the lathe.

STEVENSON, J., jun. *Improvements in lighting apartments and passages.* Dated Nov. 12, 1857. (No. 2853.)

This relates to the use of polished tile or porcelain surfaces, for transmitting external daylight into dark or badly lighted apartments and passages.

SIVRAY, F. H. F. B. DE. *Certain improvements in the construction of bedsteads.* Dated Nov. 12, 1857. (No. 2854.)

Here a bedstead is so made as to form a table when folded up. It cannot be described in detail without engravings.

WEBSTER, S. *Certain improvements in machinery or apparatus for turning.* Dated Nov. 12, 1857. (No. 2855.)

This cannot be described without engravings. It consists, 1. In an apparatus for holding articles to be turned while in the lathe, by which apparatus the arbors or mandrils usually employed are dispensed with. 2. In an apparatus to facilitate the turning of articles to one uniform length. 3. In an apparatus for turning articles with a surface in a diagonal direction to the line of the axis.

PICKING, W. *An improved method of, and apparatus for, feeding steam boilers with water.* Dated Nov. 12, 1857. (No. 2856.)

This relates to a method of, and apparatus for, feeding steam boilers with water, against any pressure, and without the aid of force pumps or other ordinary means, by means of apparatus which requires to be illustrated with engravings to render its action intelligible.

GIFFORD, W. J. *Improvements in the making, reefing, and working of sails, and in the construction and arrangement of masts, spars, and rigging, for ships and boats.* Dated Nov. 12, 1857. (No. 2858.)

This relates, 1. To the construction, arrangement, and combination of sails for ships and boats. 2. To certain systems of reefing and furling sails. 3. To a system of masting ships and boats, and arranging the standing rigging; and, 4. To a construction and arrangement of the spars, yards, and running rigging of ships and boats. The advantages derived are: the power of sailing closer to the wind than heretofore, by having a more perfect set of the canvas, and more advantageous positions thereof; the obviating of the impediments to a vessel's progress when close hauled presented by the masts and gear; the obtainment of greater command in manœuvring, especially in "staying;" and increased facility for reefing and furling the sails.

HASELTINE, G. *Improvements in machinery for the manufacture of small metallic chains.* (A communication.) Dated Nov. 14, 1857. (No. 2863.)

This consists in a machine for making small metallic chains especially designed for watch guards, &c. The functions performed by this machine include the whole process of cutting the links from the strips of metal, and their subsequent bending and uniting, till the complete chain is formed, without any intervening manual operations. The machine cannot be described without engravings.

WHEELER, G. P. *Improvements in the preparation of materials for the manufacture of paper pulp or half stuff.* Dated Nov. 14, 1857. (No. 2864.)

The chief object here is to treat flax straw in its crude state, and the waste of scutching mills, for being manufactured into paper pulp. The invention is also applicable to the maceration of other vegetable substances. For dissolving the resinous matter which binds the fibres together, the patentee subjects the flax, &c., to the macerating process, and then conveys the fibrous material to the reducing engine. He thus prevents the resetting of the resinous matter. The material to be macerated he places in cylindrical vessels of wire work, or pierced metal, and piles up a number of these in a steam-tight chamber, where they are subjected, under a pressure of steam, to the action of a macerating solution.

MACINTOSH, J. *An improvement in preparing telegraphic wire, which is coated with gutta percha, in order to render it more capable of resisting heat, and in laying down telegraph wires in the sea.* Dated Nov. 14, 1857. (No. 2866.)

When the wire has been coated with gutta percha, it is subjected to the action of sulphuric acid, and then to water, or to the action of chloride of sulphur and a solvent, by which the coating will be so changed as no longer to be liable to be injured by tropical heat or like temperatures.

NEWTON, A. V. *Improvements in apparatus for retarding and stopping the progress of railway trains.* (A communication.) Dated Nov. 14, 1857. (No. 2867.)

The main object here is to overcome the slack

occasioned by the play between the carriages, and to keep the connecting chain or rod at a uniform tension. The brakes the patentee operates by a steam piston and cylinder attached to the engine. Steam is to be admitted by a valve, the handle of which is convenient to the engineman. The principal feature of the improvements is an automatic apparatus placed at each end of every carriage which takes up the slack produced by the coming together of adjoining carriages.

HENRY, M. *Improvements in electric and galvanic conductors, and in the mode of, and machinery or apparatus for, manufacturing the same.* (A communication.) Dated Nov. 14, 1857. (No. 2868.)

This relates to a protected insulated electric and galvanic conductor, and to machinery for making the same. The conductor consists of wire insulated by gutta percha, &c., enclosed in a coating of lead. The process consists in causing a fluid to flow through a vessel between the lead and the insulated wire, to prevent the caloric heating the insulating gum, thus securing a proper relative temperature of the hot metal and the cold gum while they are moving in the same direction toward, and by the time they reach, the point of union. The machine consists of a combination of tubes as conductors for the fluid with the die.

HODGES, J. E. *Improvements in the manufacture of looped fabrics.* Dated Nov. 16, 1857. (No. 2873.)

This consists in making looped fabrics by means of the thread carriers or guides, without jacks, sinkers, or loopwheels, the thread guides forming the loop as they pass from one side of the work to the other, by a motion given from a serpentine template, or by two sets of teeth geared into each other, leaving room for a stud connected with the thread guide bar to work between them, so that in passing the thread guide from one side of the work to the other a serpentine motion is performed, which laps the thread first round one needle in one bar, then round one in the other bar, and so on alternately. The frame needles or self-acting hooks are fixed in needle bars parallel to each other, each bar having a downward motion. By passing the thread guides across the work, the thread laps round a needle in each bar alternately; the bars then go down, and in so doing press the work over, which finishes the course.

SPENCER, J. F. *Certain improvements in steam engines, and in the apparatus connected therewith.* Dated Nov. 16, 1857. (No. 2874.)

In the condensation of steam by its contact with a cold metallic surface, it is necessary to supply from some other source than the boilers an amount of fresh water equal to that wasted by the leakage, &c. The patentee does this by a small auxiliary boiler. He uses the steam generated in this boiler in an assistant engine, which works the air and condensing water pumps, and also, if required, other feed and bilge pumps. The steam used in working the assistant engine is passed into the surface condensers, and, being condensed, gives the supply of fresh water required. He also proposes to supply the waste referred to by passing the steam of the auxiliary boiler through certain steam jacketings, and thence direct into the surface condensers. In the improved arrangement of surface condensers, the current of condensing water is forced or drawn by pumps several times through different portions of the same condenser, formed with divisions therein. For forming a steam-tight joint where the tubes pass through the tube plates, he uses rings of vulcanised india rubber forced over the ends of the tubes into recesses in the tube plates, without glands or pressure rings. The improvements relating to steam jacketings consist, 1. In the application of steam-tight casings round the internal cylinders, and in the covers of all marine engines fitted with surface condensers, such casings being filled with steam. 2. In the application of such casings round the steam pipes. 3. In supplying from an auxiliary boiler the casings just described with steam of a higher pressure than that in the main boilers. The improvements in pumps (connected with surface condensation) consist in the combination in one double-acting vertical pump of the air pump and the pump for supplying the condensing water, so that the air and condensed steam from the condenser shall be received into and discharged from the upper portion of the pump, and the cold water into and from the bottom.

TAYLOR, J. *Improvements in dredging machines, which improvements are also applicable to other purposes.* Dated Nov. 16, 1857. (No. 2875.)

This consists in applying an arrangement of direct-acting double cylinder steam engines to the roller at the top of the dredging ladder, and a similar arrangement to the ladder, and another to the raising and lowering apparatus, &c., as may be desired.

RICHARDSON, T. *An improvement in treating manganese ores.* Dated Nov. 16, 1857. (No. 2876.)

This consists in subjecting black wad and similar ores of manganese to the action of regulated heat, as a preparatory process, so as to lessen or remove the water present in such ores.

GOSSAGE, W. *Improvements in the manufacture of certain kinds of soap.* Dated Nov. 17, 1857. (No. 2878.)

The patentee finds that, if, in place of converting "curd soap" (containing resin combined with resin or palm oil) into "fitted soap," and then mixing the pure portion of the soap thus obtained with liquor or runnings, he brings the curd soap itself into a state of suitable consistency, and causes this to be mixed with suitable liquor or runnings, he produces a mixed soap of superior quality, and is enabled to use a larger quantity of resin. The liquor or runnings used is a solution of silicate of soda in water.

FOXWELL, D. *The application of a certain material for the backs of cards.* Dated Nov. 17, 1857. (No. 2880.)

The patentee uses for the backs of cards a felted material composed of cotton, wool, silk, flax, &c., either separately or in combination, but not woven, in connexion with one or more layers of cloth made of cotton, linen, &c., cemented together.

PIDDING, W. *Improved manufactures and improvements in the manufacture of piled fabrics, or of mosaic or tesselated textile and other fabrics, and improvements in some of the machinery or apparatus necessary to produce them; also the application of certain existing or known machinery or apparatus for their production.* Dated Nov. 17, 1857. (No. 2881.)

This relates, 1. To new piled and mosaic or mosaic textile fabrics made as follows:—The patentee saturates and thickly coats threads or yarns with any adhesive substance in a liquid state, sometimes colouring the liquid or dissolved substances of the same colour with that of the threads or yarns they surround. Gelatine, gum, gutta percha, caoutchouc, pigment, resin, bitumen, pitch, asphalte, tallow, drying oil, sugar, and skins of animals, are some of the chief of the substances used, either separately or combined, in solution. After drying the threads or yarns, he lays them side by side, and sets them to pattern, or not, as may be required. He next heats and presses them together, and cuts them into slices transversely at their ends, and "such slices are then the complete fabric." He sometimes provides a pile on one or both sides by dissolving the adhesive substance which is at or near the surface, and separating the yarns.

BOUSFIELD, G. T. *Improvements in fire-arms, and in detonating compounds to be used therewith.* (A communication.) Dated Nov. 17, 1857. (No. 2882.)

These compounds consist of small cylindrical prismatic pieces, formed of the fulminate of mer-

cury, &c., mixed with collodion. Instead of collodion, gun-cotton may be used to enclose the fulminate, and form spindles, caps, or other primings, and then coated with the collodion to form the priming. To employ the new priming in cylinders, the patentee makes an arrangement of fire-arm in which he omits the cones, and forms a recess at the touch-hole of the fire-arm.

SMITH, S. P. *Constructing iron wheels for railway carriages and similar purposes.* Dated Nov. 17, 1857. (No. 2883.)

This invention cannot be described without engravings.

BROOMAN, R. A. *The manufacture upon circular frames of a fabric suitable for petticoats and other garments, and curtains and other articles of furniture, together with apparatus to be employed therein.* (A communication.) Dated Nov. 17, 1857. (No. 2884.)

The object here is the manufacturing, upon circular looms, of knitted fabrics with bands or stripes in plain or close knitting, to form cases to receive strips of steel, whalebone, or cane.

BROOMAN, R. A. *Improvements in gas burners.* (A communication.) Dated Nov. 17, 1857. (No. 2885.)

This invention was described and illustrated at p. 606 of No. 1820, Vol. 68.

JOHNSON, E. D. *An improvement in the construction of fusee watches.* Dated Nov. 17, 1857. (No. 2887.)

The patentee claims an arrangement of parts for throwing the intermediate pinions into action as required, and thereby communicating the axial motion of the pendant spindle either to the minute wheel for adjusting the hands or to the wheel on the fusee square for winding up the watch.

BELL, W. H. *Improvements in the permanent way of railways.* Dated Nov. 18, 1857. (No. 2888.)

Here, a rail is formed of three parts, and is used without chairs. The principal feature of the invention consists in the use of a T-shaped rail, forming the head or working surface, supported by two rectangular or L-shaped rails or plates, placed one on each side of the lower or vertical flange of the said T-shaped rail.

ALCAN, E. *An apparatus to be applied to looms for producing figured fabrics of all kinds.* (A communication.) Dated Nov. 18, 1857. (No. 2890.)

The object here is to compose an arrangement combining the advantages of the Indian spooling with economy of workmanship. The base of the invention consists in a spooling mechanism in which the spaces lost by the courses of the shuttles are got rid of.

GERMANN, A. F., F. G., and J. *An improved propeller.* Dated Nov. 18, 1857. (No. 2892.)

This requires engravings to illustrate it.

COHEN, A. A. S. *Improvements in machinery or apparatus to be employed in the manufacture of drain pipes and other like articles from plastic materials.* Dated Nov. 18, 1857. (No. 2893.)

This relates, 1. To the moulding plates or holes through which the articles are expressed. It consists in the application of a double or counter plate: the one plate forms the passage through which the smallest part of the pipe, &c., is expressed. It is in two parts, which separate, and thus enlarge the passage for the plastic material, which is then moulded by the other and fixed plate. 2. To the apron for receiving articles moulded or formed. This apron is divided into two hinged parts, so that, by making these slide transversely, to be presented alternately to the moulding plates, a series of products is deposited alternately on one table and on the other; while the first is receiving, the second is being unloaded. The knife or wire for cutting the plastic material is somewhat like that of ordinary machines.

CLEGG, R. *Improvements in registering or indicating apparatus, applicable to the registration or indication of fares, the distances passed over by vehicles, the revolutions of machines or parts of machines, and other similar purposes.* Dated Nov. 18, 1857. (No. 2894.)

The patentee affixes to an axle or other rotating part of a machine, vehicle, &c., a pin or stud, and upon a non-rotating part of such vehicle, &c., he centres a lever, one extremity of which lies within the range of such pin or stud as it rotates, and receives an intermittent motion therefrom. To the other end of the lever, a short spring lever or arm is attached, so that, when the first-named lever is moved, it imparts a corresponding motion to a ratchet wheel against which the spring, lever, or arm is pressed. With this ratchet wheel is combined another wheel, or other wheels, which transmit motion intermittently to a hand or hands moving in front of a dial or dials.

BOOTH, M., and J. FARMER. *Improvements in machinery or apparatus for stiffening, drying, and finishing cotton, linen, woollen, and other fabrics.* Dated Nov. 18, 1857. (No. 2895.)

This mainly consists in causing the goods to pass over a roller, by which starch, &c., is conveyed to them; thence they are conducted over heated cylinders, and there dried sufficiently to receive another coating, when the process is repeated as often as may be desired. The drying is finally completed by another set of heated rollers. The drying cylinders they place vertically, in series, and, if they are heated by steam, the patentees carry off the water of condensation by causing an aperture of a pipe to be presented to the water at intervals, by the revolution of the cylinder, so as to allow it to pass therein, which water also forms a trap for preventing the escape of steam. They admit steam to the cylinders by forming a space in the axle bearings, constituting a steam chamber, whence the steam flows through suitable apertures. The invention also refers to the vacuum valves of drying cylinders: these they apply to the axles, or to the bearings or stands thereof, and connect them with suitable apparatus, so that the whole series may be opened during the revolution of the cylinders. The axles of these cylinders they carry beyond the bearings, and apply the wheel by which they are driven on the outside. To regulate the quantity of stiffening matter delivered to the goods, they pass them over a roller capable of adjustment, so as to bring the goods in contact with an increased or decreased surface of the stiffening roller. In finishing printed goods by "steaming," to prevent the water of condensation from dropping on to the goods, they use an outer casing, forming a space to which steam is admitted.

BETTLE, P. *An improvement in the construction of watches.* Dated Nov. 18, 1857. (No. 2896.)

This consists in so constructing the cases of watches as to enable the wearer to transform it from a hunter to an open-faced watch, or *vice versa*, at pleasure, without detaching the box or inner case from the outer case.

WILLIAMS, C. W. *Improvements in steam-engine boilers.* Dated Nov. 19, 1857. (No. 2898.)

The introduction of diaphragms, or mechanical mixers, in the mixing chambers in the interior of steam-engine boilers or their furnaces constitutes this invention.

CLAY, W. *Improvements in metal knees employed in the construction of ships, buildings, railway or other waggons or carriages, or other analogous purposes.* Dated Nov. 19, 1857. (No. 2904.)

This consists in the application of steel to the manufacture of such articles.

CLAY, W. *Improvements in the points, switches, and crossings of the permanent way of railways.* Dated Nov. 19, 1857. (No. 2905.)

This consists in manufacturing such parts of the permanent way of railways of steel bars rolled into the required form.

MELVIN, D. *Improvements in machinery or apparatus for manufacturing heddles or healds for weaving.* Dated Nov. 19, 1857. (No. 2908.)

The patentee claims, 1. The application of gearing by which the motion of the ribcords is proportioned to the number of clasps formed to the drum giving off the ribcords, instead of to the take-up drum. 2. The omission of contrivances for raising the depressers when the braiding needles are moved outwards, or towards the great wheel, and the slight levelling of the points of the depressers, so as to be raised by the braiding needles themselves. 3. The use of a revolving wiper, acting by means of an anti-friction roller, for moving the carriage bearing the braiding needles. 4. The mode of mounting the great wheel or toothed ring upon a complete cylindrical surface, and the arrangement of mechanism for actuating the ring or tube which pushes the heddle eyes off the stud on which they are formed.

CLARKE, J. *Improvements in the construction of shafts and poles for cabs, omnibuses, and other vehicles.* Dated Nov. 19, 1857. (No. 2909.)

This consists in forming the shafts or poles of wrought iron or steel tubing.

COPE, J. *Improvements in buttons.* Dated Nov. 19, 1857. (No. 2911.)

The patentee constructs the body of the button of a ring-like piece of bone, ivory, wood, &c., covered with a fabric. A perforated disc of metal, covered by a disc of linen, is placed in front of the body. The edge of the fabric is turned over the edge of the metal shell, and the edge of the metal shell is closed upon and secured to the body of the button.

BRABSON, T. F., and G. HUGHES. *Improvements in door springs.* Dated Nov. 19, 1857. (No. 2912.)

The patentees claim, 1. The use of helical or coiled springs in the door frame, and made to act on an arm as described. 2. The use of a nearly flat spring, supported at both ends, and made to press at its middle upon the mechanism by which the door is closed.

WEST, C. L. *Improvements in window sashes.* (A communication.) Dated Nov. 19, 1857. (No. 2915.)

This consists, 1. In fixing the hinges of French casements to pieces of wood, which slide up and down the framework, similar to an ordinary sliding sash, and having sash weights connected therewith. 2. In combining a French casement thus constructed with a sliding sash placed above the French casement. The vertical meeting and sliding rails the patentee makes with tongues and grooves, thereby dispensing with metal catches.

DENTON, J. *Improvements in looms.* Dated Nov. 20, 1857. (No. 2917.)

This relates to a previous patent dated 8th Oct., 1853. Instead of shifting the bowls on the star wheel to and from the centre, the patentee places them all in the same circle, arranged to move in and out sideways, so as to be in a proper position for acting as they revolve upon the lever which raises the boxes, the lever having steps or indents, so that its length of motion may be greater or less, thereby raising the boxes to the heights required, the bowls or rollers being moved to and fro by a lever acted upon by different lengths of pegs or studs, in the lags or pattern chain, so that the right bowl may be placed over the right step in the shuttle box lever, thereby giving the latter as the star wheel and bowls move onwards the necessary motion for placing the desired shuttle box in its proper place. Modifications are included.

WALKER, H., J. BEAUMONT, and J. GOTHARD. *Improvements in steam engines.* Dated Nov. 20, 1857. (No. 2918.)

This relates to condensing steam engines, and consists in the use of an additional condenser in connexion therewith, applied so that the exhaust steam shall first pass into this condenser, so that by the injection of a small quantity of water from the hot well (or other supply) the exhaust steam will be partially condensed, and the water thus injected become heated by the exhaust steam to nearly the boiling point, to supply the boilers or otherwise. The remainder of the exhaust steam not thus condensed will pass to the ordinary condenser.

BRUSSAUT, P. A. *An improved anti-friction apparatus for shafts, axles, and other revolving surfaces.* Dated Nov. 20, 1857. (No. 2920.)

This consists of anti-friction rollers arranged round a shaft, each roller being itself free to revolve within a box or frame, all the rollers being connected to each other by endless straps or bands of leather, gutta percha, &c.

GLOVER, T., and A. BAIN. *Improvements in electric telegraphs.* Dated Nov. 21, 1857. (No. 2923.)

These combine both a signal and a recording telegraph, and have for their object the production, during the flow of an electric current, of a mark or indication by water, &c., upon a moveable surface, upon which it is retained only sufficient time to read or transfer the indications.

BENSEN, G. J. *An improvement in the manufacture of moulded sugar.* Dated Nov. 21, 1857. (No. 2925.)

This consists in removing the syrup from crystallised sugar by a pneumatic apparatus, then mixing the crystals with a clear syrup of refined sugar, placing in moulds, and stoving.

FABART, J. M. A. E. *Improvements in looms for weaving.* Dated Nov. 21, 1857. (No. 2927.)

The apparatus described by the patentee allows of weaving shawls and all figured goods on the system pursued in India, and can be employed in all reductions. It cannot be described without engravings.

RILEY, S. *An improvement in the preparation of chocolate and cocoa.* Dated Nov. 23, 1857. (No. 2929.)

This consists in the use of lentils in the manufacture of chocolate or cocoa. They may be applied in the form of a decoction or of a paste, produced from the seed or flower of lentils.

MCFARLANE, W. *Improvements in moulding or manufacturing cast-iron pipes and other generally similar hollow articles.* Dated Nov. 23, 1857. (No. 2930.)

This relates to a previous patent of the patentee, dated 26th Feb., 1857. It refers, 1. To moulding the faucet part of pipes or hollow cylinders vertically. 2. To the moulding of pipes and hollow articles of square, rectangular, trefoil, or other transverse section of a similar kind, horizontally, by the use of patterns parted longitudinally into two or more pieces, such patterns answering the double purpose of forming the mould for the outside of the pipe, &c., and the inside forming the core. 3. To a mode of facilitating the making the cores for articles of a circular, trefoil, or other shape. 4. To providing for the core being kept in the centre of the mould. 5. To the formation and use of core bars hinged either at one or more places for casting bent, angular, or irregular shaped pipes and fittings. 6. To the making of gates in moulds for pipes and similar castings.

JOHNSON, J. H. *Improvements in ships' signal lanterns.* (A communication.) Dated Nov. 23, 1857. (No. 2931.)

This lantern may be fitted with dioptric plain glass, or round lenses, and is carried at the bowsprit cap. The improvements consist in applying two coloured glass screens to the lantern, each screen forming an arc of about 90°; the one screen is composed of green glass and the other of red glass, whilst an open space of about 45° is left between the front edges of the screens, so as to show a clear white light ahead. By this arrangement a red, white, or green light will be seen according to the ship's course and the point from which the light is viewed, thus enabling the course of the ship to be defined by means of one lantern.

NEWTON, A. V. *Certain improvements in sewing machines.* (A communication.) Dated Nov. 23, 1857. (No. 2933.)

This consists, 1. In feeding the fabric by a hori-

zontally moving serrated slide arranged upon the under surface of the table. 2. In the use of the device which feeds the fabric to flatten and place the loop of the thread in the proper position for receiving the needle. 3. In the use of a solid slide in the formation of the stitch. 4. In serrating the foot which holds the cloth to the table, for preventing the fabric from being carried back by the backward movement of the feeding device. 5. In flattening and holding the loop by means of a spring operating horizontally as shown. 6. In feeding the cloth or fabric by the movement of the table. 7. In placing and keeping the loop in proper position to receive the needle by the movement of the table. 8. In the method of operating the vibrating needle below the table, for forming the double loop stitch. 9. In feeding the cloth or fabric by means of a rocker. 10. In the use of a hinged hip in the formation of a stitch. These several features of the invention cannot be described without engravings.

Hulett, D. *Improvements in cocks, taps, and valves, and in joints for pipes and tubes.* Dated Nov. 23, 1857. (No. 2934.)

These consist in making cocks, taps, and joints, or certain portions of them, of malleable cast iron, uncovered or coated, as may be desired.

Schloss, J. *A so-called Diana lock or improved fastening.* Dated Nov. 24, 1857. (No. 2937.)

This consists in bolting or locking by means of a tumbler or trigger-plate, with one or two cams acting on a bolt, and with one or two cams for catching or loosening the gudgeon of the lock. It cannot be described in detail without engravings.

Lowry, G. *Certain improvements in machinery for heckling flax and other fibrous materials.* Dated Nov. 24, 1857. (No. 2938.)

This relates, 1. To those heckling machines in which the rollers for the sheets are made to approach and recede from each other, and consists in making the guides of the heckle bars elastic, so that when the roller or rollers have been moved to approach or recede from each other the elasticity of the guides keeps them in contact with the bearings or shafts of the rollers. 2. In making the sheets of sheet heckling machines of metal, or of metal combined with leather, the object being to avoid the stretching of the sheets. 3. In the application of stays to the shafts of the rollers over which the sheets pass, to prevent the deflection of the said shafts. 4. It relates to all heckling machines in which the strick holders are traversed from one end of the machine to the other, and consists in machinery for traversing the strick holders along the rails or trough.

Searby, W. *An improved form of elastic spring, applicable to bedsteads, sofas, chairs, the padding and seats of carriages, and other similar purposes.* (A communication.) Dated Nov. 24, 1857. (No. 2939.)

This spring, which is preferably of rolled steel, is made curved in form, and nearly semi-circular when of small span, and not pressed upon. Each end is looped round the one side of a metallic buckle, so as to turn freely on it. The buckle also turns freely in the loop or eye of the spring. The other side of the buckle is attached to a looped strap, so as to turn easily in it.

Sands, C. *Improvements in stereoscopes.* Dated Nov. 24, 1857. (No. 2940.)

This relates to the actuating, adjusting, and sustaining of the flap or door of stereoscopes by which the light is admitted to the picture, such door having a reflector on the inside, which reflects and concentrates the light upon the picture.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

Rankine, W. J. M. *Improvements in fan-blowers.* Dated Nov. 13, 1857. (No. 2860.)

The inventor uses for the figure of the circumference of the case curves composed of logarithmic spirals, or arcs of circles approximating to logarithmic spirals. He makes the radius of the tips of the vanes of the fan bear to the main radius of the case a proportion depending on the proportion which the pressure of the air discharged from the casing is required to bear to the pressure due to its velocity of discharge. He makes the vanes of the fan of the form of a spiral of the second order. The effect of the action of vanes so formed upon the air is to change its motion gradually from a direct radial motion to a whirling spiral motion.

Durant, A. H. A. *An improved apparatus for husking and winnowing castor seeds for the purpose of obtaining a larger quantity and a purer kind of oil therefrom when pressed than heretofore with the outer skin or cuticle on.* Dated Nov. 13, 1857. (No. 2861.)

This consists of a cylinder with compartments therein, and attached to a shaft, so as to obtain a rapid rotary motion by the application of steam, and which, by the centrifugal force, will crack, husk, and winnow the seed thus thrown against it. Or the seeds may fall through an inclined feeder upon rapidly revolving wheels or paddles, so as to be forcibly struck thereby.

Bessemer, H. *Improvements in the treating and smelting of iron ores, and in obtaining products therefrom.* Dated Nov. 13, 1857. (No. 2862.)

This consists in washing powdered iron ores with dilute hydrochloric or other acids, with the view of separating phosphoric compounds. Also in smelting ores so treated with desulphurised coal powdered and mixed with the ore and with proper fluxes.

Bennett, J. H. *Improved compound safety valves.* Dated Nov. 14, 1857. (No. 2865.)

This consists of an arrangement of safety valves for steam, gas, &c., whereby an escape is given through the primary action of small valves, consequently reducing the weight required; at the same time the form of the combined larger valve prevents any chance of sticking, and also will, in the event of the pressure within being less than that without, allow the atmosphere to rush in, and save the vessel from collapse. The form of the improved valves cannot be described without engravings.

Fereday, J. *An improved form of steam engine.* Dated Nov. 14, 1857. (No. 2869.)

This consists of a wheel mounted upon a rotating shaft, and encased in a jacket. In this jacket, on each side of the axis, is a steam port, and into the ports the steam pipe from the boiler is fitted. Around the inside of the ports, and between the rim of the wheel and the jacket, is placed packing, to prevent the steam from passing round, forcing it to act direct upon that part of the wheel which is immediately under the port. It presses upon the rim of the wheel, and thus produces rotation.

Pochin, H. D. *Improvements in stiffening, sizeing, and finishing textile materials and yarns.* Dated Nov. 16, 1857. (No. 2870.)

These consist in the use of hydrate of alumina, either alone or mixed with silica, resins, gum, mucilages, glues, or gelatines, for the above purposes.

Donas, J. B. *A new optical instrument, which he calls physioscop.* Dated Nov. 16, 1857. (No. 2871.)

This is for the exhibition of stereoscopic plates, and has the shape of a desk, the top of which, when raised, serves as a shading reflector. The picture, if on glass, is laid on the top, and is reflected by a looking glass laid at the bottom. The images, if on paper or metallic plates, are laid at the place of the lid. By means of two buttons,

the instrument can be brought to the suitable focus.

DEBAX-TALABAS, C. *Improvements in lithographic printing presses.* Dated Nov. 16, 1857. (No. 2872.)

Here the following movements only are required:—1. When bearing upon the footboard, the moveable frame and squeezing bar are both bound at once. 2. When driving the hand-windlass the moveable frame is unhooked at the moment when the stone carriage reaches the end of its useful motion. 3. When the foot is lifted from the footboard, the squeezing bar and moveable frame are raised up at once by the action of a counterpoise.

FIELD, T. *A new method or mode of and appliances for submerging submarine telegraph cables.* Dated Nov. 17, 1857. (No. 2877.)

This consists in submerging cables by aid of a long flexible tubular cable, with a number of weights attached thereto.

RICHARDES, W. E. *An improved war weapon.* Dated Nov. 17, 1857. (No. 2886.)

Here, the inventor takes a double-barrelled pistol, and between the two barrels fixes a sword blade, and connects a guard plate from the muzzles of the pistols to the extremity of the stock, and thus renders the stock of the pistol available as a sword handle.

TINKER, J. *An improved sizeing matter.* Dated Nov. 18, 1857. (No. 2889.)

The inventor uses a compound or mixture of whiting, china clay, pipe clay, plaster of Paris, &c., with sea weeds or other vegetable or animal matters having a glutinous substance.

AYCKBOURN, F. *Improvements in bird cages.* Dated Nov. 18, 1857. (No. 2891.)

The inventor constructs such parts of the cage as hitherto have consisted of wire work, or wood and wire work, either wholly of globular or sheet glass and partly of wood, or wholly of such glass.

SMITH, W. *An apparatus for the purpose of protecting the turnip crop by destroying the turnip fly and other insects which are injurious to turnips and other plants.* Dated Nov. 19, 1857. (No. 2897.)

Here, the inventor removes insects by means of brushes attached to an axle tree, and destroys them by depositing them in a cell or trough placed inside the machine. Inside the trough a glutinous composition is placed, which prevents the escape of the insects and kills them.

MENNONS, M. A. F. *An improved washing and drying apparatus.* (A communication.) Dated Nov. 19, 1857. (No. 2899.)

This consists of a perforated rotating drum, the ends of which are provided with covers. In the interior are perforated partitions secured to an internal cylinder, so as to form chambers, having openings for the deposit or removal of the articles to be washed or dried. The washing liquid enters the cylinder near the axis, through a pipe fitted with a stop cock, and passes out by centrifugal action through the holes in the drum, so as to wash the articles.

KELK, T. H. H. *Improved metallic alloys.* Dated Nov. 19, 1857. (No. 2902.)

The inventor combines steel, nickel, tin, and copper. He takes from 1 to 15 oz. of steel, and combines it with from ½ to 12 oz. of nickel, from ½ to 12 oz. of tin, and from ½ to 15 oz. of copper.

GILL, S., and H. NEWTON. *Improvements in obtaining stereoscopic pictures.* Dated Nov. 19, 1857. (No. 2903.)

This consists in obtaining the double image to form the stereoscopic picture by a double reflector, and then taking the pictures by a camera from the reflectors, which may consist of two silvered plates placed at an angle to each other.

COFFEY, P. E. *An improvement in the process of distilling.* Dated Nov. 19, 1857. (No. 2906.)

This relates to Champonnois' process of distilling, which consists in extracting the saccharine principles from beet root, &c., by the aid of the spent wash obtained from the distillation of the saccharine juices during a previous operation. The object of the present invention is to adapt Coffey's distilling apparatus to this process.

GOEDICKE, R. *The suspending of the lines of electric telegraphs in the air by means of gas balloons, across water and land, or the atmospheric telegraph.* Dated Nov. 19, 1857. (No. 2907.)

The title of this invention will probably be considered a sufficient description of it.

CURTIS, J. E. B. *Improvements in apparatus for filing papers and documents.* Dated Nov. 19, 1857. (No. 2910.)

Here, each apparatus is made with a flexible file of cord, &c., which is constructed so as readily to be divided in its length and again connected, to admit of an intermediate paper being removed.

CANTELO, W. J. *Improvements in the preparation and application of graves or cracklings for the purposes of animal food and manure.* Dated Nov. 19, 1857. (No. 2913.)

The inventor arranges a series of the cakes in two cradles, and applies one on each side of a saw working in a frame, by which the ends of the cakes in each cradle are simultaneously sawn and reduced to a powder, like sawdust, or cut in slices; this operation is repeated until the whole is reduced.

KEIGHTLEY, B. *An improved apparatus for indicating and registering the flow or supply of air to mines and other places requiring ventilation.* Dated Nov. 19, 1857. (No. 2914.)

This consists of a case provided with a dial and pointers, and of a vane or wind pendulum suspended from the interior of the case. The upper part of the pendulum rod is formed with a toothed piece in gear with a pinion, to which one of the pointers is attached, and which thus works with the pendulum, and indicates the force of the current. Another pointer carrying a stud is lodged in a socket, and may be moved by hand to correspond with any position of the pendulum, and held so by a spring; but, should the current of air be altered, this registering pointer will be moved by the movement of the pendulum, so as to denote the altered amount of air admitted, and will remain so until reset. There are modifications included.

HINKS, J., G. WELLS, and J. L. PETIT. *An improvement or improvements in metallic pens.* Dated Nov. 20, 1857. (No. 2916.)

Here, the writing end of the pen is curved in a direction contrary to that of the body of the pen, so that in writing the end of the pen presents a convex figure to the paper.

PAGE, H. *Improvements in the manufacture of sheet and crown glass.* Dated Nov. 20, 1857. (No. 2919.)

This consists, 1. In flattening sheet glass by a vacuum and atmospheric pressure to force the glass down upon a flat perforated fire stone; a vacuum being formed under the fire stone after the glass is laid thereon, the pressure of the atmosphere presses down the glass flat and smooth thereon. 2. In applying the power to spread out the glass at the circumference instead of at the centre, whereby the glass is produced of a uniform thickness throughout, and without any knob or knot.

BESSEMER, H. *Improvements in the manufacture of iron and steel.* Dated Nov. 20, 1857. (No. 2921.)

This consists in reducing rich iron ores, such as hematite, by highly heated reducing gases, such as carburetted hydrogen, in close chambers heated, if requisite, externally. The lumps of spongy metal are coated with pitch, tar, &c., or with lime, clay, &c., to prevent oxidation by exposure to the air. This metal may be used for making charcoal iron in the charcoal refinery, or it may be puddled or decarbonised by currents of air.

CHODZKO, N. F. B. DE. *Improvements in furnaces for heating boilers.* Dated Nov. 21, 1857. (No. 2924.)

This consists in substituting for the ordinary fire bars tubular bars placed obliquely and made to

communicate with water spaces open to the boiler, whereby a continuous circulation is kept up through the fire bars and the boilers.

HALL, S. *An improvement in apparatus for igniting matches and other articles.* Dated Nov. 21, 1857. (No. 2926.)

This consists of a hollow cylindrical apparatus closed at the bottom, but near it the sides are perforated with holes for the passage of air into the interior. The outside is formed rough, or has a perforation applied thereon to act by friction on a prepared match, &c. When one end of a match, &c., has been partially lighted, that end is introduced into the interior of the hollow apparatus. The warmth caused by the partial ignition heats the air, and induces it to rush up the interior of the apparatus, which will very quickly fan the flame and increase the ignition of the lower end of the match, &c.

WRIGHT, J. *Improvements in the mode of treating madder for printing, dyeing, and distilling purposes, and also in the preparation and treatment of silk, cotton, and woollen cloth for printing and dyeing.* (A communication.) Dated Nov. 21, 1857. (No. 2928.)

This chiefly consists in mixing the madder with water, and then subjecting it to pressure. In some cases a minute quantity of sulphuric acid may be used with the water. The expressed liquid is collected, and after standing forms a jelly, which again, upon standing still longer, separates into a liquid and a partly solid form. The liquid being decanted, the residuum is washed, and, when mixed with gum, is ready for printing or dyeing. Other features are included.

BARLOW, C. *Improvements in steam and air engines and furnaces therefor.* (A communication.) Dated Nov. 23, 1857. (No. 2932.)

This consists in using steam at high pressure in one engine, and then surcharging it with heat before it passes to the low-pressure or condensing engine; in using the air in one end of the cylinder, or separately, after being perfectly tempered; in arranging the superheating surfaces of the boiler so as to maintain the temperature in an engine at such a point that lubrication with oil can be maintained; and in introducing into the high-pressure engine the use of a close engine and superheating pipes to surcharge the steam.

WILKINSON, T. C. *Improvements in pump valves.* Dated Nov. 24, 1857. (No. 2936.)

The inventor constructs the valve of a cylindrical form (vertical section in the form of an H), such valve working freely but fluid-tight in a cylindrical chamber on the pump casting. This chamber is formed on one side with an inlet port or ports, and with a single outlet port on the opposite side. The central portion of the valve has corresponding apertures in it, arranged so that, when the working piston of the pump is in motion, the vacuum on one side and the compression on the other will move the valve so as to open the inlet and the outlet alternately. Packing rings are fitted into the valve for keeping it fluid-tight.

LEMAIRE, F. *An improved petticoat for ladies' wear.* (A communication.) Dated Nov. 25, 1857. (No. 2942.)

The inventor takes a piece of calico, &c., and shapes it to form: on this form he arranges a quantity of down. He then lays over the down another piece of calico, &c. The whole is sewn together so that, when completed, it will have the appearance of a series of horizontal corrugations, care being taken to vary these at the hips, so that the corsage may set as usually worn.

BERNARD, C. *Certain improvements in heating apparatus.* (A communication.) Dated Nov. 25, 1857. (No. 2946.)

These consist, 1. In preventing the injurious action of the fire on the iron casing of the furnaces. 2. In clearing the grate of scoria. 3. In preventing the caking of the coal in the furnace. 4. In keeping up a current of gas used for heating a boiler. 5. In a mode of feeding the furnace with fuel. 6. In constructing the upper part of furnaces with refractory clay, and the lower of sheet iron.

HOGG, J. *An improved safe or depository for cash, deeds, or other valuables.* Dated Nov. 25, 1857. (No. 2947.)

This safe consists principally of two parts—an outer casing or box, and an inner tray. The outer casing is of a flat cylindrical form, and is closed with the exception of an opening in the top of a triangular form. This opening is closed by a sliding shutter, turning freely upon a centre pin. The sliding shutter is secured by a lock. The inner tray fits closely the interior of the outer case, in which it is capable of revolving. This tray is closed at the bottom, but open at the top, and is divided into compartments by radial divisions. The tray is furnished with a lock, spring, or catch, so that it cannot be turned round without previously being released. It will be evident that, when the revolving shutter is opened, only one compartment is exposed at a time, and it is intended that the compartment of the tray which is opposite to the opening when the tray is locked should be empty, or contain only silver, copper, &c., and that valuable articles should be placed in the other divisions, so that, if a thief should pick the outer lock, he will find the compartment empty or containing articles of little value, and it will still be necessary to pick the second lock, or discover the secret of the spring or catch, before he can revolve the tray and gain access to the other compartments.

TISDALL, E. C. *Improvements in the mode of preserving animal and vegetable fluids, and fluids containing animal and vegetable substances.* Dated Nov. 25, 1857. (No. 2948.)

The inventor places the fluid in glass bottles, so as nearly or quite to fill them. He next raises the vessels to a high temperature, by placing them in a chamber which is then deprived of atmospheric air. By a jet of steam, he keeps them at that temperature until all the oxygen has been rendered incapable of producing decomposition. He then removes the vessels, fills them to overflowing by the addition of the same fluid at a similar high temperature, and covers the orifices of the vessels with caoutchouc, gutta percha, bladder, &c. When the liquid cools, it sinks, leaving a vacuum between its upper surface and the covering.

MANNING, W. T. *Improvements in the treatment of sewage, and in the apparatus employed therein.* Dated Nov. 26, 1857. (No. 2949.)

This consists of a vessel of boiler plate, perforated at the bottom and sides. It is closed at the top, and is surrounded at the perforated parts by a woollen cloth stretched over its outer surface. This vessel is placed within a second of similar construction. A space is left between the two vessels, being filled with animal charcoal, &c. The sewage is forced into the inner vessel by force pumps, while another pipe admits compressed air. At the bottom of the inner vessel is a pipe for the discharge of the solid material into hermetically closed barges.

FARROW, C. *An improvement in fire-arms.* Dated Nov. 26, 1857. (No. 2951.)

The inventor attaches to the stock an instrument which takes hold of the end of the cartridge, so that when the cartridge is forcibly pulled away its end is torn off. The instrument is a curved lever mounted on an axis, and under one end of the lever is a spring, which causes its other end to press on a roughened plate of metal fixed to the stock.

SHONER, J. F. *Improvements in common road carriages.* Dated Nov. 26, 1856. (No. 2952.)

This consists in attaching the splash leather to the axles or to the springs. By this means they may be made much narrower than ordinary leathers, and the wheels may be brought closer to the sides of the vehicle. To protect ladies' dresses from the wheels, a screen is fixed to the front part of the splash leather of the hind wheels. A brush of short hair may also be used for removing the dirt from the wheels as they revolve.

PROVISIONAL PROTECTIONS.

Dated March 4, 1858.

430. W. Wilkinson, of Bayswater, engineer. Improvements in machinery and apparatuses for spinning threads, for preparing threads for weaving and knitting, for covering cores with fibrous and other materials, and for making ropes, parts of which are applicable as pulleys, reels, and bobbins.

Dated April 10, 1858.

776. J. Oxley, of Beverley, carriage builder. Certain improvements in the doors and sashes of carriages.

Dated June 15, 1858.

1350. B. Pitt, of Great Carter-lane, Doctors'-commons, engineer. Improvements in the construction of knobs and roses used with locks, latches, and such like fastenings as are constructed with spindles.

1352. Baron F. J. von Wedel-Jarlsberg, of Frederikswœrn, Norway. An improved self-registering compass or control compass.

1354. Sir F. C. Knowles, of Lovell-hill, Berks, Bart. Improvements in the fabrication or manufacture of steel.

1356. A. Dembinsky, of Islington, professor of chemistry, and A. C. Engert, of City-road, merchant. An improved fire-proof composition or wash.

Dated June 16, 1858.

1358. B. Predavalle, of New Oxford-st., engineer. Improvements in the mode of obtaining motive power.

1362. W. Sawney, of Beverley, agricultural implement maker. Improvements in apparatus applicable to screening, winnowing, and corn-dressing machines.

1364. J. H. Dickson, of Rotherhithe, manufacturer. Improvements in machinery or apparatus for scutching and hackling flax, hemp, and other similar fibrous materials.

1366. J. Westwood, of Isle of Dogs, ship builder. Improvements in the construction of iron ships.

1368. T. Steven, of Glasgow, ironfounder. Improvements in making moulds for casting.

Dated June 17, 1858.

1370. F. Walton, of Wolverhampton, manufacturer. A new or improved manufacture of japanned wares.

1372. J. Allardice, brassfounder, of Glasgow, and W. Miller, manufacturer, of Blantyre. Improvements in gaseliers.

1374. G. Hale, of Tavistock-st., Covent-garden, boot manufacturer. Improved apparatus for obtaining motive power.

1376. C. Crockford, of Holywell, smelter. Improvements in the treatment of the ores of zinc, and in spelter making.

Dated June 18, 1858.

1378. J. Shaw, of Leicester. Improvements in fire-arms.

1380. W. Spence, of Chancery-lane. Improvements in clogs, shoes, or supports for the feet. A communication.

Dated June 19, 1858.

1382. F. G. Spilsbury, of Dresden, Saxony, gentleman. Making tungstic acid and certain of its salts, and for using the same to decolor acetic acid and its compounds.

1386. R. and T. Winans, of Baltimore, U.S. A new and useful improvement in the form of the hulls of steam vessels.

1388. R. and T. Winans, of Baltimore, U.S. A new and useful improvement in ocean steamers.

1390. R. Halldon, of Willenhall, Stafford, locksmith. Certain improvements connected with engines worked by steam or atmospheric power.

Dated June 21, 1858.

1392. Sir J. C. Anderson, of Fermoy, Cork, Bart. Improvements in locomotion, parts of which are applicable for other purposes.

1394. R. A. Brooman, of 166, Fleet-st., London, editor of the *Mechanics' Magazine* and patent agent. Improvements in steam cocks. A communication from A. Reding.

1396. J. Lawder, lieut. and brevet-captain in the Honourable the East India Company's army. A method of supporting or carrying knapsacks, packs, and other weights on the back.

1398. W. C. Wilkins, of Long Acre, lighthouse engineer. Improvements in lamps.

1400. W. E. Newton, of Chancery-lane. An improved method of effecting the separation of the fibres of wood for the manufacture of paper therefrom, which is also applicable to the separation of the fibres of flax or other substances for the manufacture of textile fabrics, and also to the separation of other substances for similar or other purposes. A communication.

1402. W. E. Newton, of Chancery-lane. Improvements in the process and machinery for obtaining from waste and refuse felted fabrics of wool, fur, or other materials, fibres in a suitable condition for being worked into felt and other fabrics. A communication.

1404. H. Deacon, of Widnes Dock, near Warrington, alkali manufacturer. Improvements in purifying alkaline lees.

Dated June 22, 1858.

1406. G. Schaub, of Birmingham, electro-metallurgist. Improvements in the manufacture of door-plates, sign-boards, and other surfaces, having inscriptions, designs, or ornaments thereon, and in the manufacture of detached letters, designs, and ornaments to be affixed to walls and sign-boards or used for other like purposes.

1408. J. Pym, of Trinity-sq., gentleman. Improvements in machinery for felling trees.

1410. W. E. Kenworthy, of Leeds, chemist. Improvement in manufacture of steel.

1412. E., H., and F. C. Cockey, of Frome, engineers. Improvements in apparatus employed in the manufacture of cheese.

Dated June 23, 1858.

1414. S. Barlow, of Stakehill, near Middleton, bleacher. Improvements in machinery or apparatus for bleaching or cleansing textile fabrics or materials.

1416. C. Vero and J. Everitt, of Atherstone, hat manufacturers. Improvements in the manufacture of hats.

1418. W. and J. Clibran, of Manchester, machinists. Improvements in apparatus or arrangements for distributing, governing the pressure of, and lighting gas.

1420. Sir J. Paxton, Knight, M.P., of Sydenham. Improvements in the manufacture of horticultural buildings or glazed structures for horticultural and other purposes.

1422. W. E. Newton, of Chancery-lane. Certain improvements in centrifugal governors for steam engines and other motors. A communication.

Dated June 24, 1858.

1423. C. Bordas, of Upper Stamford-st., Blackfriars-road, designer. Improvements in the mode or method of producing embroidery.

1424. J. Bates, of Hyde, spinner, J. York, of Hyde, iron moulder, and W. Parkin, of Sheffield, iron founder. Improvements in pistons and plungers.

1426. G. Collier, of Halifax, York. Improve-

ments in means or apparatus for the stretching and drying of woven fabrics.

1428. W. E. Newton, of Chancery-lane. Improved machinery for manufacturing friction matches. A communication.

Dated June 25, 1858.

1432. J. Betts, of the Strand, map publisher. Improvements in obtaining surfaces on which to print maps and other designs.

1434. T. Booth, of Rahere-street, Goswell-road, carpenter. Improvements in mounting and fitting wheels and axles to carriages, which improvements are also applicable to pulleys and other parts moving on axes.

1436. J. Maudslay, of Lambeth, engineer. An improvement in the construction of furnaces for melting iron, steel, and other metals.

1439. J. Taylor, of Swanton Novers, Thetford, farm bailiff. An improvement in the construction of horse-hoes, applicable also to drills.

Dated June 26, 1858.

1442. S. Whitehall, of Nottingham, mechanician. Certain improvements in finishing lace and other fabrics.

1444. J. A. Manning, of the Inner Temple, esquire. An improved mode of intercepting and treating the sewage of London, and towns and cities similarly situated.

1446. D. Campbell, of Kirkaldy, Fife. A new grubbing and harrowing land-roller.

1448. E. E. D'Heurle, of Paris, manufacturer. Improvements in boxes for keeping and measuring coffee, tea, and other substances requiring to be preserved from contact of the air.

1450. C. Erhard, of Paris, engineer. Improvements in apparatus for boring wells. A communication from Chanoit and Catelineau.

NOTICES OF INTENTION TO PROCEED.

(From the "London Gazette," July 13, 1858.)

406. J. Billing. "Throat and door for chimneys."

410. A. Ripley. "Rolling and polishing leather."

415. E. H. C. Monckton. "Distilling and rectifying."

418. G. and J. Kirkley. "Perforating slates."

419. B. Parker. "Materials for coating, cementing, bedding, and otherwise protecting bodies."

423. W. H. Graveley. "Purifying mineral waters."

424. J. Fowler, jun. "Laying telegraph cables."

429. J. Knowelden. "Obtaining motive power."

439. H. G. Collins. "Obtaining impressions from engraved plates."

446. J. H. Johnson. "Railway signals." A communication.

447. C. R. Moate. "Permanent way."

449. S. Wheatcroft. "Cap fronts, ruches, and ribbon trimmings."

451. J. S. Nibbs and J. Hinks. "Lamps."

461. J. H. Johnson. "Aluminium and its alloys." A communication.

488. R. Roberts. "Engraving," &c.

493. F. A. Verdeil. "Treating madder."

496. M. Smith. "Looms."

499. J. Warburton. "Carding engines." Partly a communication.

501. T. T. Chellingworth. "Suspending chandeliers."

508. J. T. Coupier. "Paper and pasteboard."

513. S. Walker. "Tubes of copper and alloys of copper."

531. E. A. L. D'Argy. "Rotary hydraulic blowing engine."

532. D. Gallafent. "Cooling liquids and condensing vapours."

541. W. and J. Todd. "Power looms and shuttles."

610. C. F. Quintin. "Kneading machine."

623. J. V. Heilakker. "Machine for compressing."

724. S. Fox and J. Chesterman. "Stays; steel employed therein; other articles of dress."

961. J. Martin. "Pulping roots and other substances."

1164. G. E. Morse. "Fire-arms and cartridges"

1181. G. Cheadle. "Flooring cramp."

1228. A. Barchou. "A heel for boots and shoes."

1291. A. Robertson. "Stoves."

1312. G. Castle. "Ventilating women's stays."

1318. T. Chatwin and C. Taylor. "Screw stocks."

1328. G. Bartholomew. "Gas meters."

1330. S. Cheavin. "Pigment, cement, or mastic; washing, scouring, cleansing, and bleaching."

1360. B. Atwater. "Sewing machine."

1386. R. and T. Winans. "Hulls of steam vessels."

1387. R. and T. Winans. "Steam vessel."

1388. R. and T. Winans. "Ocean steamers."

1389. R. and T. Winans. "Steam vessels."

1404. H. Deacon. "Purifying alkaline lees."

1431. C. W. Cahoon. "Sowing seed or fertilising material."

1436. J. Maudslay. "Furnaces for melting metals."

1442. S. Whitehall. "Finishing lace."

Opposition can be entered to the granting of a Patent to any of the parties in the above List who have given notice of their intention to proceed, within twenty-one days from the date of the Gazette in which the notice appears, by leaving at the Commissioners' office particulars in writing of the objection to the application.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

1516. J. A. Bellay.
1518. A. H. A. Durant.
1547. J. H. Nalder.
1548. J. Wilson.
1552. T. W. G. Treeby.
1555. C. F. Bielefield.
1561. E. D. Chattaway.
1562. J. Caldow and J. B. A. McKinnell.
1603. H. S. Boase.
1612. J. Reilly.
1773. E. Hall.

LIST OF SEALED PATENTS.

Sealed July 9th, 1858.

44. T. Knowles and W. Ogilvie.
45. I. Taylor.
54. E. B. Bright.
56. W. Parsons.
57. C. E. Matson.
66. J. Varley.
85. W. Waller.
97. W. Muir.
103. W. Conisbee.
104. P. Robertson.
114. W. Clark.
121. A. Sterry.
136. J. and P. Garnett, jun.
149. J. W. Midgley.
152. P. Bussi.
165. R. Weare.
255. L. Cass.
660. W. Chadwick.
956. R. Johanny.
978. L. Talabot.
998. T. Preston.
1059. G. Lowry.
1096. S. Carpenter.

Sealed July 13th, 1858.

51. C. Barlow.
52. G. W. Muir.
53. R. A. Brooman.
63. J. Stenson.
64. H. Ingle.
67. C. Schinz.
76. E. Hills.
80. R. A. Brooman.
82. A. & T. Walker.
94. C. N. Nixon.
113. J. S. Brown.
162. J. Elder.
209. G. Bertram and W. McNiven.
239. W. Brown and C. N. May.
278. E. D. Johnson.
577. D. Harris.
844. C. Hawker.
860. E. Derogy.
1078. R. Hislop, jun.
1081. A. Wolff.
1149. A. P. Price.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned above.

CONTENTS OF THIS NUMBER.

LONDON: Printed and Published by Richard Archibald Brooman, of 166, Fleet-street, in the City of London; Sold by A. and W. Galignani, Rue Vivienne, Paris; Hodges and Smith, Dublin; W. C. Campbell and Co., Hamburgh.

Mechanics' Magazine.

No. 1824.] SATURDAY, JULY 24, 1858. [Price 3d.

Edited by R. A. Brooman and E. J. Reed, 166, Fleet-street, London, E.C.

INGLE'S PATENT IMPROVEMENTS IN PRINTING MACHINES.

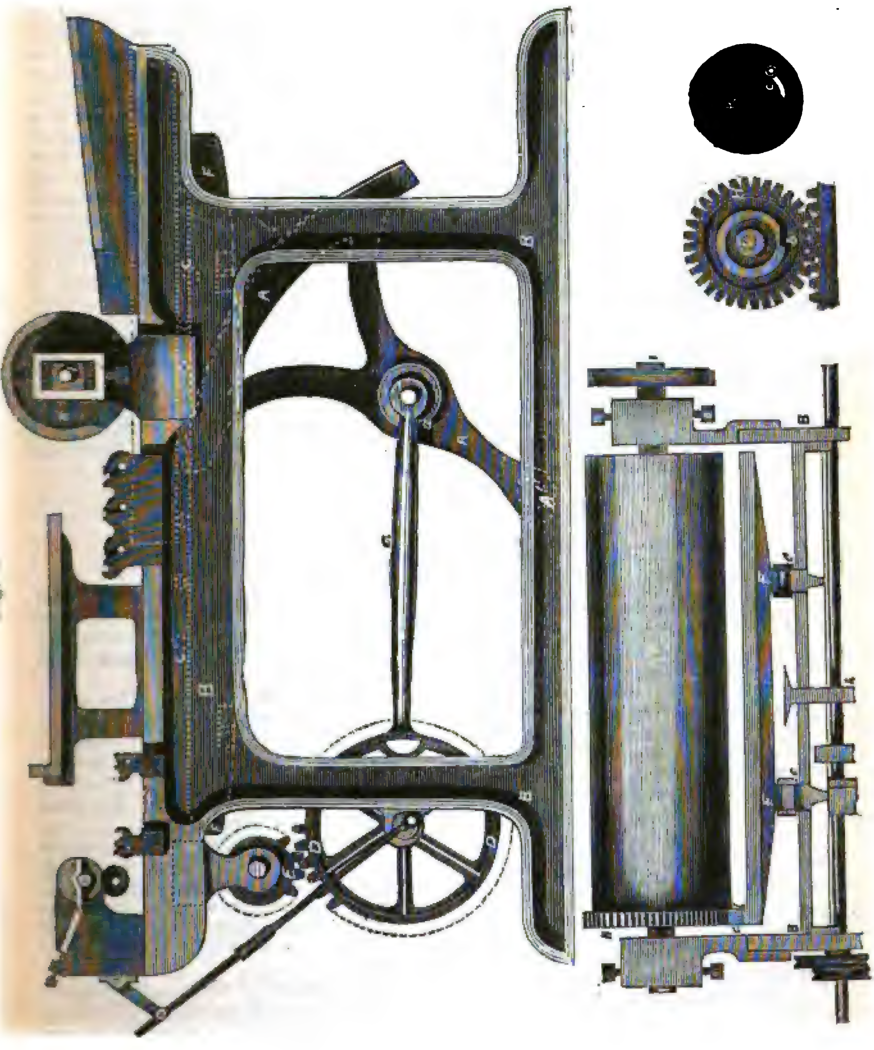


Fig. 1. Fig. 2. Fig. 3. Fig. 4.

INGLE'S PATENT IMPROVEMENTS IN PRINTING MACHINES.

Mr. H. Inglé, of Shoe-lane, Engineer, has patented certain improvements in printing machines which effect a considerable reduction in their cost. His invention consists in imparting the to and fro motions to the table carrying the types or printing matter from a sector or quadrant in the centre of the machine, or from two sectors or quadrants one at each side of the machine, made to rock, and connected by steel or other suitable bands or chains to the ends of the table; and in driving the cylinder or drum carrying the paper by means of a rack or racks which work into a toothed wheel loose upon the shaft of the cylinder. Upon the cylinder is a ratchet which causes the cylinder and wheel to move together when the rack upon the table moves in one direction, but permits the cylinder to remain stationary and moves the wheel only when going in the contrary direction.

Fig. 1 of the engravings on the preceding page shows in side, and fig. 2 in end elevation, the principal parts of a printing machine constructed according to the invention. A is a quadrant which works in sockets formed at A′ in the lower part or bed of the frame, B, of the machine. C is a connecting rod or lever joined to the quadrant at *a*, and in connection with the cogged wheel, D, to which motion is communicated through the pinion, E, which is driven in any convenient manner. Thus as the wheel, D, revolves a to and fro motion is imparted to the quadrant. Round the quadrant, A, bands or chains are passed which are connected to the ends of the table, F, for carrying the type or other printing matter, so that as the quadrant moves it carries with it the table and parts connected thereto. On the upper part and at one side of the table there is a rack, G, into which a toothed wheel, H, is geared, which is loose on the shaft, I, carrying the cylinder or drum, K, for receiving the paper. On the inner side of the toothed wheel, G, a view of which is given at fig. 3, there is a notch or stop, *b*, formed; and to the end of the cylinder, K, seen at fig. 4, which abuts against the wheel, G, a ratchet or paul, *c*, is attached, which, as the rack and table move in one direction, leaves the cylinder stationary, allowing time for the paper to be placed on, but when going in the contrary direction the paul enters the notch and causes the cylinder to move with the toothed wheel, and thus the paper is passed over the type or printing surface. The table runs on flanged rollers, *c*, *c*, seen in fig. 2, and in dotted lines, fig. 1.

Instead of employing bands or chains passing round the quadrant for imparting motion to the table or type-carrier, the patentee sometimes forms a rack on the surface of the quadrant, which gears into teeth formed on the lower part of the table. Two quadrants may also be employed, one at each side of the machine.

THE MODE OF MAKING THE NATIONAL SURVEY.

Our readers are aware that a national survey, entitled the Ordnance Survey, is now in course of progress in this country, and is regarded with considerable interest. We, therefore, without entering into the objects and expenses of the undertaking, propose to place before them the following authentic account of the different processes adopted in the field, and at the principal office at Southampton, in the preparation of the maps and plans. These processes are divided into several branches.

1.—Triangulation.

The survey of the United Kingdom is based upon and connected with a triangulation which extends over the whole country.

The distances between the trigonometrical stations are derived from the measured base lines on Salisbury Plain and on the shore of Lough Foyle in the north of Ireland. This most important branch of the work has been executed with the greatest possible degree of accuracy, the difference between the measured lengths of the bases of verification and their computed lengths not exceeding 2½ inches in about seven miles.

The average length of the sides of the triangles in the *principal triangulation* is about 60 miles, but many of the sides exceed 100 miles in length. A full account of all the observations and calculations connected with this branch of the work has just been published.

The primary triangulation is next broken up into smaller triangles, the sides of which are from five to ten miles long, and this *secondary triangulation* is again broken up into triangles the sides of which are about one mile long, to form the *tertiary* or *minor triangulation*.

The men employed to make the detailed survey then actually measure the length of each side of the minor triangles on the ground, noting in their "field-books" every fence, stream, or other object they may

cross. They then measure cross lines from one side of the triangle to the other, and, by taking offsets from the measured lines to every object on the face of the country, they obtain in their field-books the data for plotting accurate plans of the country upon any scale which may be required. The length of every measured side of a triangle is therefore checked by the computed trigonometrical distance, and the accuracy of the lines within each triangle is checked by the plotting, and thus no errors which may be made by the surveyor can escape detection.

By this method not only is perfect accuracy obtained in every part of the detail of the survey, but every object is in its exactly correct relative position to every other object however distant; thus, for example, any house on a plan of part of the centre of the kingdom is not only in its correct position in relation to any other house in its neighbourhood, but it is in its exact relative position to any and every house from Caithness to Cornwall.

2.—Levels.

The *levels* which are engraved on the plans are all given in relation to one datum level, that for Great Britain being the level of mean tide at Liverpool; and in relation to this datum, *principal lines of levels* have been carried all over the kingdom from Cape Wrath to the Land's End; and thus again the levels which are published on the plans are strictly correct in relation to each other, however widely separated the places may be.

3.—Scales for the Plans and Maps.

The *scales* which were adopted for the Ordnance survey of Great Britain are, for—

Towns, $\frac{1}{500}$ of the actual linear measure;

Parishes, $\frac{1}{2500}$, or 25·344 inches to a mile in the cultivated districts;

Counties, 6 inches to a mile;

The Kingdom, 1 inch to a mile.

The parish plans on the 25-inch scale, or the scale of *one inch to one acre*, are traced, and 30 copies taken by zincography.* Tables containing the area of each separate enclosure are published with these plans. Each sheet is sold separately; they are one and a half miles long and one mile wide, and therefore contain 960 acres.

The plans of the towns, counties, and the present map of the kingdom are engraved on copper.

* Orders to discontinue making these plans have been given in consequence of the decision of the House of Commons on the 18th June, 1857.

Lithography, Zincography, and Anastatic Process.

The plans of parishes on the $\frac{1}{2500}$ scale have been produced either by lithography, zincography, or by the anastatic process.

Zincography is now generally adopted on account of the facility of handling thin zinc plates rather than lithographic stones, which are necessarily very heavy, and are constantly liable to be broken.

The anastatic process will probably be valuable hereafter, as by its means as many copies of a zincograph as we please can be obtained from a single copy, and the stock of impressions of the plans can therefore be replenished *ad libitum*.

The copies of the plans produced by the three processes are scarcely distinguishable.

4.—Lithography.

The plan is first traced with lithographic ink on tracing paper, which is thinly coated with starch or paste, and for the sake of cheapness the outline is traced by boys, the woods and figures are stamped, and only the writing and a few details requiring some taste in drawing are traced by draftsmen; the drawing should not be too fine, and the lines should be firmly traced.

When completed, the tracing is laid between sheets of damp paper, and is afterwards ready to be transferred to stone or zinc.

The stone must be previously polished with pumice stone, any former drawing having been first removed from its surface by rubbing it face to face with another lithographic stone, using silver sand and water between; a final polish is given to the stone by rubbing with a piece of "water of Ayr stone," or steatite.

The stone being prepared, the tracing is laid upon it, and is passed through the lithographic printing press about a dozen times, care being taken to damp it once or twice during the process, after which it is peeled off, and it will then be found that the ink from the tracing has adhered to the stone, to which, therefore, the drawing has been transferred.

As the stone has an affinity for grease of every kind, it is necessary to be careful to keep the tracing perfectly clean, and not to touch it with hot hands, &c., otherwise spots of grease will be transferred to the stone, and cause the prints from it to be dirty. These spots can, however, be removed with dilute nitric acid, or rubbed off with the "water of Ayr stone."

The next process is to etch the stone with dilute nitric acid, and afterwards to pour on it a solution of gum arabic; the acid effects a chemical change on the surface of the stone, diminishing its attraction

for grease; it also removes any small particles of grease which may have adhered to the stone, and by opening its pores enables it better to imbibe wet, while the gum water fills up the pores, and prevents the blank parts of the stone from taking up the ink in printing.

The stone is now washed over with turpentine to remove all but the fatty portion of the transfer ink, after which the drawing is inked in by passing the printing roller over it, or, which is probably better, by rubbing it over with a piece of flannel charged with printing ink.

When the lines have been thus sufficiently charged with ink, the printing may be commenced—the paper on which the impressions are taken being damped for some time before it is used, and, after each impression, the printing roller is passed over the stone, which is constantly kept damp by sponging.

5.—Zincography.

The zinc plates are prepared by first rubbing off with "water of Ayr stone" any previous drawings which may be upon them, and afterwards graining them with fine sand and water, using for the purpose a zinc muller or rubber.

The drawing is made and transferred as in lithography; but, instead of using nitric acid, the zinc plate is etched with a solution of nutgalls.

If any alteration has to be made in the drawing, after scraping off the old work with "water of Ayr stone," the part scraped must be grained anew with fine sand before any new drawing is made upon it, or the first lines may be obliterated with a solution of fused potash, which forms, at the same time, a finely grained surface suitable to receive additions.

6.—Anastatic Process.

This is a patent process by means of which any drawing or print, however old, which has been made with a greasy ink, may be transferred to a zinc plate, and copies of it obtained by printing from the zinc.

It is first ascertained, by rubbing a piece of thin paper over some part of the drawing, whether the ink is so fixed that no trace of it will come off by pressure; if this is the case, the drawing is immersed for a few minutes in a hot solution of strontia (1 oz. of strontia to a quart of water), which has the effect of loosening the ink; it is then partially dried, and afterwards is immersed in a solution of nitric acid (one to six of water). If the print be comparatively new, the strontia bath is not required, and it is only necessary to immerse it in the nitric acid. The drawing is then ready to be transferred to a zinc plate previously polished as finely as possible with powdered emery, and etched by placing a sheet of paper over it damped with nitric acid, and passing it through the press. The transfer is effected by passing the plate through a copperplate printing press, after which the drawing is removed and the plate wiped over with gum water. It is then charged with printing ink, and subsequently etched with phosphoric acid, a few drops of which are mixed with gum water, after which it is ready to be printed in the usual manner.

7.—Reduction of Plans by Photography.

The plans of towns on the $\frac{1}{500}$ scale and those of the cultivated districts on the $\frac{1}{2500}$ scale, are reduced to the scale of 6 inches to a mile for engraving by photography.

The collodion process is employed for the purpose of taking the negative copy. The lens of the camera is a single achromatic meniscus, $3\frac{1}{2}$ inches in diameter, with a principal focal length of 24 inches.

The plan to be reduced is attached to a board, which can be adjusted by a screw to any height above the ground which may be required, and turns upon a central pivot.

The camera is placed opposite to it on a table which runs upon wheels on a small tramway laid down on the floor of the photographic room.

The required scale of the reduction is obtained by tracing on the ground glass of the camera a rectangle corresponding on the reduced scale to the rectangle of the plan to be reduced. The curvature of the image and indistinctness of outline from spherical aberration are both remedied by reducing the diaphragm in front of the lens to a small aperture.

The negative, having been obtained upon glass, is placed in the printing frame in contact with sensitive paper, and in this manner as many positive prints as may be required are taken in succession.

In reducing plans it has been found convenient to colour the houses yellow, by which means they print sharp and black on the paper, the yellow ray, as is well known, having no effect upon the sensitive coating of the glass plate on which the negatives are taken. The introduction of this process has very much reduced the cost of reducing plans, and saves an immense quantity of time and labour.

(To be continued.)

METROPOLIS LOCAL MANAGEMENT ACT AMENDMENT BILL.

This is the title of the Bill introduced by Mr. Disraeli into the House of Commons to confer upon the Metropolitan Board of Works powers to purify the Thames from the sewage of London. It provides that the Board shall commence the intercepting sewerage works as soon as may be, and that the points of outfall may be any place on the left bank or shore of the river not higher than the west bank of Barking-creek, and any place on the right bank or shore of the river not higher than Crossness-point in Erith Marshes, provided the sewage be effectually deodorised, or the solid deposits separated and intercepted before the discharge into the river. It provides that the Board may construct works on the shores and bed of the Thames, and it also confers powers of taking land to apply for the purpose of deodorising works. The Board of Works may appoint a committee of six—three to be a quorum—for the purposes of the works, and delegate to it full powers. At any time after the passing of the Act, and before the end of 1864, the Board may raise three millions sterling by bonds on debentures, with the consent of the Treasury, and the Treasury is authorised to guarantee the interest and repayment of the moneys thus borrowed. The money borrowed is to be applied only to works under the Act. The Treasury is also authorised to appoint inspecting engineers to examine the progress of the works from time to time, and report. The Metropolitan Board of Works is empowered to levy yearly for forty years a rate of 3d. in the pound on the property in the metropolis; and the rate is to be called "The Metropolis Main Drainage Rate."

All parts of the metropolis are to be deemed to be equally benefited by the expenditure under this Act; and the provisions applicable to other assessments of the Metropolitan Board are to be extended to assessments under the present Act. The rates are to be made by the Metropolitan Board in default of vestries, &c., in payment of precepts. The powers of inspection of the Board over county rates are to be extended to other rates, and penalties are imposed for refusal to allow such inspection. All moneys from the rate leviable under the proposed Act are to be paid at the Bank of England. In pursuance of the Treasury guarantee, it is proposed that the Treasury may issue payments, if necessary, out of the Consolidated Fund, which moneys shall be repaid from the rate. The rate may be determined when the money borrowed is repaid. In the meantime, and until the rates contemplated by this Act shall have been completed, the Metropolitan Board is to deodorise sewage, so as to protect the public health, and defray the charge thereof as expenses incurred under the existing Metropolitan Local Management Act, but in this work they must not create a nuisance.

The enactments of the existing Metropolitan Local Management Act requiring the approbation of the Commissioners of Works, &c., are to be repealed; and the time for the completion of works is extended to the end of 1863.

The proposed Act and the existing one are to be read together.

THE TRANSPORT OF TROOPS TO INDIA.

As soon as the alarming extent of the Indian Mutiny became known, the English public became very urgent in their desire to have troops transported to the scene of the revolt with the utmost facility, and the adoption of the overland route for as many troops as could be despatched across the desert and down the Red Sea, and of steamers for the regiments which had to make the long sea voyage, was urged upon the Government. Some months, however, elapsed before they adopted either, and a Committee of the House of Commons was consequently appointed to investigate the circumstances attending the delay. The report of the Committee has been presented to the House, and is as follows:—

1. That the inquiry which this Committee has been appointed to conduct may be divided into three branches: the first, relating to the overland route to India; the second, to the employment of steamers, as compared with sailing vessels, for the transport of troops round the Cape of Good Hope; and the third, to the use made during the mutiny of the military resources of this country and of the Colonies.

2. That the Court of Directors appear from the first intelligence of the mutiny at Meerut to have been sensible of the advantages of the overland route, and to have lost no time in recommending its adoption; but that political and other considerations deterred Her Majesty's Ministers from at once assenting to that recommendation.

3. That the Committee cannot judge of the validity of those political objections, as they felt themselves precluded from inquiring into them; but that they ceased to prevail in the first week of September, when the more serious character of the war and the lateness of the season for ships departing for Calcutta led to a formal re-

quisition from the Court of Directors, and to a compliance with it on the part of the Cabinet.

4. That it would have been desirable, independently of political considerations, to have taken advantage of the overland route at the earliest possible period, and, apart from such considerations, it is much to be regretted that the steps that were taken in September to transmit small bodies of troops by this route were not resorted to at an earlier date. That the transport, however, of any large body of troops would have required previous arrangements, and that the evidence laid before the Committee leaves great room to doubt whether any considerable reinforcements could have been sent in the months of July and August, with a prospect of their arrival in India so far in advance of those sent round the Cape, as to give any great advantage in favour of this route.

5. That, although the overland route may be advantageously employed in times of emergency, it would not be advisable that it should be relied upon as the ordinary route for the transmission of troops to India.

6. That if steamers had been used in greater numbers the reinforcements would have reached India more quickly than they did by sailing vessels; but that no evidence has been laid before the Committee to show that, at the time the emergency arose, a greater amount of steam transport was attainable, whilst it has been shown that grave doubts existed whether the supply of coal on the route would have been sufficient for a larger number of steam vessels than were actually employed.

7. That steamers should for the future be always made use of, as far as possible, in urgent cases; but that, for the transmission of the ordinary reliefs, the Committee would not recommend the adoption of so costly a mode of transport.

8. That the Governors of Ceylon and the Mauritius gave early and valuable assistance to the Government of India, and deserve great praise for the zeal and promptitude with which they acted; that the Governor of the Cape without loss of time forwarded treasure and horses, together with a portion of the troops at his disposal, but that he did not send the whole amount of the force which he was instructed by the Home Government to transmit to India; that the Committee have not the means of judging whether the circumstances of the colony did or did not justify Sir George Grey in taking this course.

9. That the Committee observe with satisfaction that the people of Canada displayed great readiness to afford assistance to the mother country; and that the Committee are of opinion that it is highly desirable to give every encouragement to such demonstrations of loyalty on the part of the colonies.

10. That on the whole, considering the suddenness of the danger and the distance to which the troops were to be sent, the Committee are of opinion that great credit is due to the Court of Directors of the East India Company for the promptitude and efficiency with which they discharged the difficult task of transmitting reinforcements to the army in India during the past year.

It may be stated that with the above report a draft report is published, drawn up by General De Lacy Evans, the Chairman, of a different tenor,—in fact, advocating the adoption of the overland route for all troops despatched to India, except recruits.

THE COPYRIGHT OF DESIGNS ACT, 1858.

A Bill to amend the Act of the Fifth and Sixth Years of Her present Majesty, to consolidate and amend the Laws relating to the Copyright of Designs for ornamenting Articles of Manufacture, has been introduced into the House of Commons by Mr. Cheetham, Colonel Wilson Patten, and Mr. Turner, and will in all probability become law, having passed through Committee in the House of Lords on Monday last.

The Bill provides that in respect of the application of a new and original design for ornamenting any article of manufacture contained in the tenth class mentioned in "The Copyright of Designs Act, 1842," the term of copyright shall be *three* years, to be computed from the time of such design being registered; but the term of copyright shall expire on the 31*st of Dec. in the second year* after that in which the design was registered, whatever may be the day of registration.

Nothing in the Fourth Section of the Act of 1842 shall deprive the proprietor of a new design applied to ornamenting any article of manufacture contained in the tenth class of the benefits of "The Copyright of Designs Acts" or of this Act, provided there shall have been printed on such articles at each end of the original piece thereof the name and address of the proprietor, and the word "Registered," together with the years for which such design was registered.

The registration of any pattern or portion of an article of manufacture to which a design is applied, instead of or in lieu of a copy, drawing, print, specification, or

description in writing, shall be as valid and effectual as if either of these had been furnished to the Registrar.

The proprietor of the extended copyright shall, on application by or on behalf of any person producing or vending any article of manufacture so marked, give the number and the date of the registration of any article of manufacture so marked; and any proprietor so applied to who shall not give the number and date of such registration shall be subject to a penalty of *ten pounds*, to be recovered by the applicant, with full costs of suit, in any Court of competent jurisdiction.

Any person who shall wilfully apply any mark of registration to any article of manufacture in respect whereof the application of the design thereto shall not have been registered, or after the term of copyright shall have expired, or who shall, during the term of copyright, without the authority of the proprietor of any registered design, wilfully apply the mark printed on the piece of any article of manufacture, or who shall knowingly sell or issue any article of manufacture to which such mark has been wilfully and without due authority applied, shall be subject to a penalty of *ten pounds*, to be recovered by the proprietor of such design, with full costs of suit, in any Court of competent jurisdiction.

Notwithstanding anything in "The Copyright of Designs Acts," it shall be lawful for the proprietor of copyright in any design to institute proceedings in the County Court of the district within which the piracy is alleged to have been committed, for the recovery of damages, provided that in any such proceedings the plaintiff shall deliver with his plaint a statement of particulars as to the date and title or other description of the registration whereof the copyright is alleged to be pirated, and as to the alleged piracy; and the defendant, if he intends at the trial to rely as a defence on any objection to such copyright, or to the title of the proprietor therein, shall give notice of his intention to rely on such special defence, and shall state in such notice the date of publication and other particulars of any designs whereof prior publication is alleged, or of any objection to such copyright, or to the title of the proprietor to such copyright; and it shall be lawful for the judge of the County Court, at the instance of the defendant or plaintiff respectively, to require any statement or notice so delivered by the plaintiff or the defendant respectively to be amended in such manner as the said judge may think fit.

It shall be lawful for the judge of the County Court, after the issuing of any plaint for the piracy of copyright, and either before or after the hearing of any plaint, to grant such order of injunction, inspection, or account, and from time to time to make such order therein as may appear to him expedient; and every such order shall have the same force and effect and be capable of being enforced in the same manner as an order for an injunction, inspection, or account made by any one of the superior courts of law or equity; but any person aggrieved by any such order may appeal to any one of the superior courts against the same by motion, or in such manner as the courts may from time to time direct.

The proceedings of County Courts Acts shall be applicable to proceedings for piracy of designs, so far as they are not inconsistent with the provisions of this Act.

ROYAL AGRICULTURAL SOCIETY OF ENGLAND.

The twentieth anniversary of the Royal Agricultural Society's show was opened at Chester last week. The show ground occupies about twenty-five acres of the Roodee, better known as the race-course, and the fittest that could possibly have been selected. The entries for stock, &c., exceeded by one-fourth the entries at any former meeting, and the subscription list amounted to upwards of £9,000. The prizes offered were consequently more numerous and larger than usual. The trial of steam engines for agricultural purposes commenced on the 15th. The judges in this department were Mr. Fothergill, consulting engineer, of Manchester; Mr. E. Woods, C.E., London; and Mr. Owen, of the firm of Sandford and Owen, Rotherham. Tuxford and Co.'s vertical cylinder engine, with the working parts enclosed, occupied the first position at the close of the trials. Fifty firms entered into competition for prizes. The trial of threshing machines commenced on Friday, 87 having been entered by 46 exhibitors. A new portable combined double-blast steam threshing machine, by Messrs. Ransomes and Sims, attracted a good deal of attention. It is fitted with a patent adjustable drum, and Brinsmead's patent shakers, and is also furnished with a finishing dressing part, fitted with a patent screen, which can be adjusted to suit any grain. This machine was highly spoken of. The judges of the threshing machines were Messrs. Barker, Shackel, and Clarke. The judges of miscellaneous inventions were Messrs. Hicken (Bourton, near Rugby), J. Druce (Ensham), and Professor Wilson (Edinburgh).

The steam ploughing competition has been the great attraction. Mr. Boydell's machine has been doing heavy work in its

own ungainly way. Mr. Rickett, of Buckingham, has a steam cultivator composed of a shaft carrying prongs and rotating in a direction opposite to that of its own progress. But Howard's (on the system of Mr. Smith, of Little Woolston) and Fowler's have been the real competitors.

It is to be regretted that a steam plough recently patented by Mr. Chandler, of Bow, and Mr. Oliver, of Hatfield, was not brought forward at the Chester meeting. Judging from the work which we saw it perform some weeks since, in a field on Mr. Oliver's farm at Hatfield, we have no doubt of its success if put in competition with others. Its cost is very much less than that of Fowler's, or any other at present in operation, in consequence of the smallness of its dimensions. It will doubtless be at the next year's exhibition; but before that, if we mistake not, its merits will make themselves known.

The Rifleman's Manual; or, Rifles, and how to use them. By Hans Busk, M.A., First Lieutenant Victoria Rifles. *Second Edition.* Illustrated with numerous Engravings. London: C. Noble, 312, Strand.

The Victoria Rifles consist of a regiment of gentlemen volunteers, whose head-quarters are at Kilburn, and whose establishment of officers is one lieutenant-colonel (the Duke of Wellington), one major, four captains, eight lieutenants, an adjutant, and a surgeon. Taking forty names at random from those which have been added to the muster roll during a few weeks, we find among them three members of Parliament, fifteen graduates of Oxford and Cambridge, twenty-five members of the bar, a captain in the army, and six county magistrates. The high character of the corps will, therefore, at once be seen. There is only one other corps of the kind, the head-quarters of which are at Exeter. If there be not an unconscious leaning on the part of Lieut. Busk towards his own regiment, the Victoria Rifles are highly disciplined and efficient soldiers. "From the Company to which I have the honour to belong," he says, "I could pick out some as accomplished swordsmen as any school of arms can produce; and at the target, the majority of these riflemen would be found far superior as marksmen even to the far-famed Chasseurs de Vincennes." It is a proof of considerable talent and enterprise in the author, that he has produced a highly interesting and instructive treatise on the arm in the use of which his comrades are so skilful.

But few persons have any just conception of the quantity of ammunition which is uselessly expended when armies engage, in consequence of the want of judgment displayed in the selection of the proper time to fire, and of precision in the aim of the troops. Colonel Schimmbach, of the Prussian artillery, informs us that from long statistical calculations it has been ascertained that, on an average, a man's own weight in lead and ten times his weight in iron were consumed for each individual placed *hors de combat* during the Peninsular War. At Vittoria, on the morning of the 21st June, 1813, each British soldier had in his cartouche-box 60 ball-cartridges, altogether 3,000,000 rounds; besides which 1,350,000 rounds more were issued to the troops by the field-train. It may be fairly assumed that 3,675,000 were altogether used. Now, it is known that of 90,000 of the enemy, 8,000 only were killed and wounded. Consequently, only *one musket-shot in four hundred and fifty-nine* took effect; and this excludes all account of the injuries inflicted by 90 pieces of artillery, each firing 73 shots or shells. Probably not more than 1 musket-ball in 800 was effective in killing or wounding. Even so late as 1851, a patrolling party at the Cape expended 80,000 ball-cartridges in killing or disabling 25 naked savages—3,200 rounds to each Kaffir. When these facts are considered, no room is left to doubt the importance of rendering the arms used as perfect as possible, in order that inefficiency in them may not be added to the unskilfulness of the soldier.

Lieut. Busk, in the work before us, has executed the difficult task of criticising the various improved descriptions of small arms with much fairness and with conspicuous ability. We could readily refer to weapons which he has not noticed, although they deserve attention; but his investigations of Jacob's, Colt's, Lancaster's, Whitworth's, Prince's, and Terry's rifles and breech-loaders are sound, impartial, and, to a great extent, original. In an introductory chapter he gives a well-considered historical sketch of Brown Bess and her rivals, and in his later chapters supplies detailed information respecting the manner of using the rifle and all connected with it. His concluding chapter treats of volunteer rifle corps, and in an appendix he records methods of finding heights and distances, velocities of shot and shell, &c. Men having to do with small arms, whether for sporting or for military purposes, will derive from it information of which but very few are already possessed, but which would be found extremely serviceable to them.

In discussing the Lancaster rifle, which the author considers the best of all the

rival weapons, he quotes the evidence of Lieut.-Col. A. Lane Fox, Chief Inspector of Musketry at Malta, who recently delivered a lecture at the United Service Institution, and there confirmed his former favourable opinion of that rifle. From the tables compiled from the results obtained at Malta, it is seen that, during three years' practice at Hythe, the highest percentage of first-class shots with the Enfield rifle never amounted to 63, while at Malta, with the Lancaster carbine, the percentage amounted to nearly 78; for out of 189 men (previously unskilled in the use of any kind of fire-arm) all but 20 were, in a few days, ranked in the first class. "We cannot but admit," says the author, "that this report establishes a high character for the Lancaster rifle. It is free from many objections that were formerly urged against rifles generally, and it is almost impossible that the barrel should lead after any amount of firing. It is readily cleaned, and, for sporting purposes, it has this advantage over every other denomination of rifle—that it can upon emergency be used with good effect as a shot gun. I have stated above, that, so far as the principle is concerned, it is a modification of the two-grooved, but at the same time a modification that obviates all the objections to which the system was open. General Jacob is evidently under a misapprehension in this matter. He calls the elliptic bored 'only the two-grooved rifle in disguise,' and adds that, 'if the shoulders of a two-grooved rifle be removed, you have the Lancaster rifle; but, by the removal of these shoulders, the friction, if the twist be considerable, becomes *enormous*. The ball and the bore are not quite round but nearly so, wherefore, as the ball is compelled to follow the twist of the bore, it acts like a "cam," and endeavours to burst the gun. The heat developed by the friction must be very great, and the tendency of the gun to burst, or the shell to crush, also very great.' Having given the matter very close attention, I am enabled confidently to state that the whole of this supposition is founded in error. I do not indeed think that the General can ever have tried the Lancaster rifle, but rather suppose that he has been induced to put these opinions upon paper from what he has heard and read, rather than from what he has actually seen. So far from friction being 'enormous,' it is less than that generated in any other kind of rifle. It is also utterly impossible for the bullet to act destructively on the barrel in the way suggested. No doubt many were led to distrust the Lancaster principle from the failure of some of the early attempts to project shells from some of the guns of heavy calibre. The blame, however, in those cases really rested with the shells, which were originally made in two pieces, welded or brazed together. By the force of the explosion in the chamber of the gun, flame was driven through flaws in the imperfectly united metal, and the shell, of course, often exploded in or at the muzzle of the gun. Had the shells been properly made, this could not have happened."

We observe with much pleasure that Lieut. Busk has the justice and the gallantry to recognize the true position which Captain Norton holds, and to state his claims without reservation. In his preface, after alluding to the reduction of atmospheric resistance upon projectiles, he says:—"I cannot allude to this great improvement without offering a simple tribute of justice to Captain Norton, whose unrequited labours and investigations for five-and-thirty years have been incessant, by informing those who may not already be cognizant of the fact, that it is to him we are mainly indebted for the original suggestion of the conical bullet. He has, in addition, devised a variety of most useful, important, and ingenious projectiles, all answering perfectly the purposes for which they were respectively intended; yet I believe that this gallant veteran has never received the smallest acknowledgment from the country for his valuable services, nor any requital for the outlay his experiments must have occasioned, any more than for the talents and assiduity so disinterestedly displayed in carrying them out."

And again, at p. 43, he says:—"These percussion rifle shells are termed by General Jacob 'the most formidable missile ever invented by man.' They are not, however, so recent an invention as he probably imagines. Captain Norton (of the gallant 34th Regt.) must be considered the original inventor of the application of the percussion principle to shells of this kind, he having successfully experimented with them as far back as 1823. In 1824 he completed an elongated rifle shot and shell, the former precisely upon the principle of the Minié ball. Captain Norton, indeed, has for more than thirty years advocated the elongated form of shot for the rifle, and has also demonstrated that a solid, leaden, acorn-shaped shot fired from a common rifle will expand for half its length from the base, but will not carry its point foremost during the whole of its flight, unless the centre of gravity be in the fore part of the shot. It can, moreover, be satisfactorily proved that upwards of a quarter of a century ago Captain Norton actually devised and freely offered to the Government, though unfortunately in vain, almost all the improvements that have recently been brought

forward and some of them adopted as novel inventions. I have made this digression with no view to detract in the slightest degree from the real merit of General Jacob's invention; the General, no doubt, was not cognizant of Captain Norton's previous claims, but I think it right to put upon record the simple facts, in fairness to a gallant Peninsular veteran, whose many interesting and important discoveries have never been properly appreciated. The percussion tubes for the Jacobite rifle are made of copper, and fit into the fore part of the shell. Each tube, about the thickness of a quill, and three-quarters of an inch long, is closed at one end, terminating in a cone that contains the fulminating powder; the rest of the tube is filled with fine gunpowder, stopped with a cork or plug varnished over. The position of this tube in the shell will be at once understood by reference to the woodcut given. The Norton rifle shell, introduced thirty years ago, produced the same effect by similar means. The shell was oblong, with projections to fit the grooves of the barrel, the percussion powder inserted into the shell itself being retained there by a wooden plug which projected from the anterior part of the missile. As long ago as 1839 I made and fired hundreds of them, and never knew one to fail or to explode in the gun. Their effect when they burst in timber is terrific, not one whit less so than those of General Jacob, who says that two good riflemen provided with them could annihilate the best field battery of artillery now existing in ten minutes."

COLONEL JACOB'S RIFLE.

GENTLEMEN,—It was only a few days ago that Mr. Daw, gunmaker, showed me a Jacob rifle; the improvement of making the ends of the barrels, at the muzzle, *pointed* like a cone, so as to admit the wings or projections on the elongated shot or shell readily to find their place even in the dark, or with the head averted, is a very ingenious and efficient contrivance. Mr. Daw showed me his own mould for casting elongated shot and shell; I can fairly say that it is a very excellent plan of bullet mould.

I am, Gentlemen, yours, &c.,

J. NORTON.

Rosherville, July 17th.

A Treatise on Rope Making, as practised in Private and Public Ropeyards, with a Description of the Manufacture, Rules, Tables of Weights, &c. Adapted to the Trade, Shipping, Mining, Railways, Builders, &c. By ROBERT CHAPMAN. London: E. and F. N. Spon, 16, Bucklersbury. 1858.

THE author of this little book insists strongly upon his fitness to write upon the art of rope making, informing the reader that he has been "employed in all the branches of rope maker, sailor, and rigger, many years." He subsequently became foreman to Messrs. Huddart and Co., of Limehouse, and attained the culmination of his career by an appointment to the master rope-makership of H. M. Dockyard at Deptford. In a sort of dedication "To Master and Journeymen Rope Makers, Ship Owners, Captains, and the Mercantile Marine," Mr. Chapman graciously condescends to state that, should his book be the means of "*raising any one to the same sphere in life*," it will be a gratification to him. In the name of the persons addressed, we beg to approach the author, and to present to him the thanks that are justly his due for so obliging an expression of his good wishes!

"This work has been written," says Mr. Chapman, "with the view of assisting the workman in obtaining a knowledge of the calculations necessary to the art of rope making. Having, in the course of my own practical employment, been frequently in want of such rules, and as often disappointed when asking for information of those it might have been expected from, I was, in consequence, compelled to form rules to enable me to carry on the work, and to answer questions put to me by the officers of the dockyards through the Lords of the Admiralty, and which were often very absurd; hence, the following rules and tables will be found chiefly to consist of those practical rules connected with the art of rope making."

The "trade, shipping, mining, railways, builders, &c.," to which singular group of persons the book is "adapted," will discover another glimpse of the author's personal greatness in the preceding passage. They will see that while he held office in Deptford Dockyard, when the other officers of the establishment wished to put a question to him, they had to get the Lords of the Admiralty to do it for them; and, when their Lordships ventured to submit the questions, the ex-rigger often pronounced them absurd. Surely but few master riggers have been so honoured as to have the questions of their colleagues put to them "through the Lords of the Admiralty;" and still fewer, if possible, have had the

boldness afterwards to pronounce inquiries thus made "absurd."

If the rope-making reader can manage, however, to lose sight of the exalted position (late master rope maker of a dockyard*) of the author, and confine his attention to the practical part of this little treatise, he will do well; for, like most *practical men*, as they call themselves, he is very sound in respect to what relates to his trade, although thoroughly nonsensical in respect to what does not relate to it. The book is an excellent compendium of the rules with which the rope maker should be acquainted; and, as but little has been written previously upon the subject, it will be found very valuable to all engaged in the business, whether as masters, foremen, workmen, or apprentices. It is also to be prized on the ground that it will tend to improve the manufacture of an article upon which property, and even life, are daily dependent.

* We should be glad to learn how many men Mr. Chapman had under him in Deptford Dockyard. At present there is not one rope maker in that establishment.

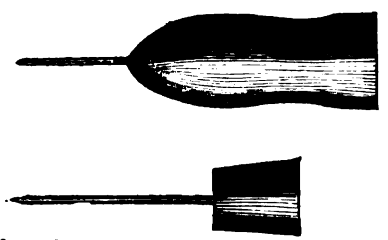
THE ELLESMERE MEMORIAL.

About twelve months ago, a subscription for erecting a memorial to the late Earl of Ellesmere was commenced among the managers and clerks connected with the Bridgewater Trust. The esteem in which the late earl was held by numerous persons in and about Manchester prompted them to request to be allowed to subscribe to the memorial fund also. This proposal was accepted, and thenceforth the public were allowed to subscribe, and ultimately a sum of upwards of £1,800 was raised. Since then, architects and others were invited to send in designs or models for the monument, and 161 designs and 19 models have been received from 161 competitors. Six of these were selected by the committee and sent to Mr. E. M. Barry, of London, the architect of Covent Garden Theatre, who awarded as follows:—First prize to Messrs. Driver and Webber, London, (accepted); Second prize, 40 guineas, to Mr. John Lowe, Manchester; Third prize, 20 guineas, to Mr. E. Bassett Keeling, London. The accepted design by Messrs. Driver and Webber, of Seymour-chambers, Adelphi, London, is for a beautifully chased tower of Victorian Gothic character, consisting of an octagonal shaft, rising to a height of 132 feet from a base 49 feet square, approached by bold stone steps. Ornamental panels are sunk in the sides of the base, and bordered by coloured tiles. In one of these panels are the arms of the deceased earl, with an inscription to his memory beneath. There are of course many other features, which will doubtless be duly described in the architectural and building journals. It will suffice for us to say, that the whole design is not only indicative of very superior taste on the part of Messrs. Driver and Webber, but also proves that they are thoroughly alive to the best influences which modern improvements are exerting upon their art, and are equally determined to resort to nothing mean or meretricious for their effects. The selection of so pure and excellent a design is a refreshing novelty in art competitions, and speaks much for the judgment of Mr. Barry.

The monument will, we understand, be erected on the high land near Wrenswood, a little to the westward of Worsley Hall. The designs and models are now being exhibited at the Royal Institution, Manchester.

ELONGATED RIFLE SHOT *CAST* ON ITS WOODEN PLUG.

Gentlemen,—As far back as the year 1823, I cast my elongated rifle shot and shell so as to have the centre of gravity in the fore part. I had not, at that time, ever heard of the celebrated Robins; the first time I ever heard of him was in the year 1824, and it was to Robert Cassidy, Esq., of Monasterion, Ireland, that I am indebted for the knowledge that Robins had written on the nature of rifle fire-arms. All writers on the rifle *now* advise that the centre of gravity should be in the fore part of the shot; I have effected this in many ways. The accompanying engraving shows the



shot when cast, and also the wooden plug on its pin to support it centrally in the mould. This shot is best adapted for breech-loading rifles; the pressure in passing through the barrel is only on its shoulder and base, the centre portion receiving no pressure, and is coated with the lubricating ointment.

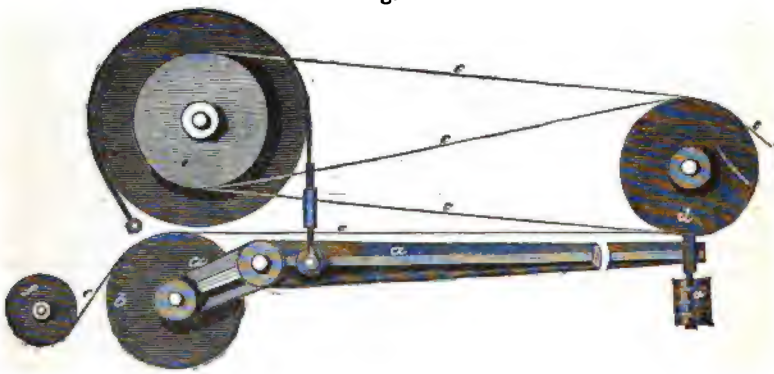
Mr. Greenwood, engineer, Broad-street, Golden-square, has now in operation a most efficient lever for compressing *cast* rifle shot into the perfect form. All earnest riflemen would do well to inspect it.

Rosherville, 12th July. J. Norton.

THE ATLANTIC CABLE APPARATUS.*

GENTLEMEN,—We beg to draw your attention to an apparatus we have invented for paying out telegraphic cables. Our object has been to render it impossible to have a greater strain on the cable than that to which the machine might be set, no matter how much the ship might pitch or roll. This we confidently believe we have accomplished, by making use of that force which now snaps the cable in two, causing it to ease the breaks, and thus allow the cable to run free so long as an excessive strain continues. This can be easily made plain on inspection of fig. 1. *a, a,* is a lever carrying a weight, *w,* at one end and a friction pulley, *b,* at the other.

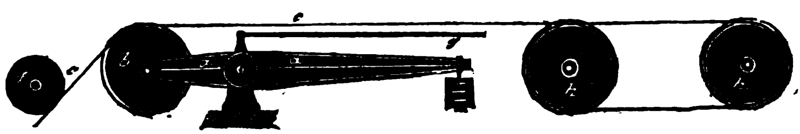
Fig. 1.



The cable, *c, c, c,* on coming from the hold passes over the pulley, *d,* on to the pulley, *e,* which carries a break connected to the lever, *a, a.* It finally passes over the pulley, *b,* and under the pulley, *f,* into the sea. Now, the principle feature of our invention is this:—Whenever the strain on the cable is such that it causes a downward pressure on the pulley, *b,* greater than the balance weight on the other end of the lever, *a, a,* has been adjusted to resist, the pulley, *b,* must descend, the break end of the lever must rise, and the pulley, *e,* is left free to go round. The use of the pulley, *f,* is to maintain a constant angle between the cable going on to the pulley, *b,* and leaving it; otherwise the strain on the pulley, *b,* would not correspond with the strain on the cable.

Fig. 2 shows our break-relieving apparatus, which we have contrived in pursuance of the same principle, to be applied to the machinery now on board the *Agamemnon* and *Niagara.* Here, when the excessive strain comes on the cable, the pulley, *b,* descends, and a strain is put upon the rod, *g,* which may be used to take off the breaks from the pulleys, *h, h,*

Fig. 2.



of the old machine. Although we have shown this last application, we do not recommend it equally with the arrangement before described, but place it before you merely to show how the principle could be applied with the present machinery. A very slight inspection will show the superiority of fig. 1 in its entirety to the one in question (fig. 2).

It needs but few remarks to show to

* The above communication is from the "Two Working Mechanics" whose letter appeared in the *Times* of Tuesday last.—EDS. M. M.

your readers, and to the shareholders in particular, the tremendous risk that is run by allowing a machine to be used which, in its very nature, allows the cable to receive the destructive strain before it can be recorded by the indicator or the attendant on the breaks knows it is necessary to release them. This serious defect must be obviated, for the cable should never for an instant be suffered to endure more strain than is desired.

We here beg to draw your attention to the report of the trials, for the purpose of illustrating our argument. It will be seen that with a pressure upon the breaks of 2,000 lbs. the indicator recorded 6,000 lbs. on the cable, proving that the machine carries within itself the very essence of failure, and affords a very natural reason why the cable has sometimes parted in the sea; for, after tugging and tearing through the machine (supposing it might escape breakage for the moment), it must be obvious that before it reaches the bed of the ocean it has still to bear the strain caused by the rising of the discharging vessel, under-currents, &c.; and consequently the part which successfully resisted the strain at first gives way upon this additional and unnecessary trial of its strength.

It has been suggested by one of your scientific contemporaries that the cable should have entire freedom. We agree with this to a certain extent, but still see the necessity of a proper and judicious check on its otherwise too rapid paying out, entailing a heavy loss by a needless expenditure; though, undoubtedly, entire freedom must be submitted to in the sudden and dangerous movements which of necessity will exist.

The important provision for safety, by allowing the cable to run free at the critical periods of its passage to the sea, we feel confident would be attained by the use of the principle we have now the honour to submit to you; and we have no doubt that, being now fully open to your criticism and that of your numerous scientific readers, the defects, if any, will be fairly shown. It is possible that, in carrying out the details, alterations in the disposal of the breaks and pulleys might be found necessary, but the principle of the machine we submit with confidence as the only one by which the much-desired instantaneous freedom can be given. Experiments would fully prove the truth of our assertion, but our humble position prevents our being able to test it by such means.

Believing that the splendid idea of conveying a channel for thought through the mighty waste of waters demanded the attention and co-operation of all men, we applied ourselves assiduously to the task of devising a machine combining within itself all the requirements of so important a preliminary. The result of our united efforts we have now the honour to lay before you, a description of the same having been previously published in the *Times* of the 18th September last, in a letter signed "Two Working Mechanics," and was also communicated to the Atlantic Telegraph Company, to whom a model was also exhibited; but, while eliciting the warmest approbation from many gentlemen of high scientific attainments, some in connection with the Company and some not, it was only partially adopted by an approach to the principle of self-action; whereas, to be effectual, it is necessary to combine the whole in the manner now shown.

The growing desire and absolute necessity for the establishment of telegraphic communications to all parts of the world render it imperative that in order to avert the sacrifice of so much valuable time and capital in the important preliminary of submerging the cable (such, for instance, as have we witnessed so recently in the case of the Atlantic Company), those who are charged with the onerous duty of supervising the operation should endeavour to avail themselves of the wisest counsels it is possible to procure, regardless of the source from whence derived, whether emanating from the brain of the hard-handed sons of labour, or their more eminent and learned brethren. It is but simple justice to those who have invested their capital in such important schemes, that no jealousy should be allowed to intervene to prevent the adoption of such a plan as would in all human probability secure the great end in view.

Disavowing any desire to condemn in a factious spirit the productions of others, we beg leave to assert that our sole object is to conduce, if possible, to the success of the gigantic enterprise now immediately under notice, or to any similar one that may hereafter be undertaken.

We are Gentlemen, yours, &c.,

James Mather.

Thomas Richards.

Woolwich, 19th July, 1858.

The Atlantic Cable.—The laying-down squadron started from Ireland on Sunday last, to renew the attempt to lay down the cable. The *Times* of Thursday, the 22nd inst., publishes a very able communication from its correspondent at Queenstown, advocating the use of light ropes as alone applicable to deep-sea purposes.

PAYING OUT CABLES.

Gentlemen,—I read in the newspapers that the Atlantic cable broke on the sea bed, arising, it is supposed, from a kink. This prompts a second question—what caused the kink? The cause, to my mind, seems very clear.

The manipulation of the cable, from the commencement of delivering it upon shipboard to the laying it upon the ocean bed, is exactly similar to that of giving twist to yarn in the act of spinning. The cable, I presume, is laid in a coil on shipboard by a man walking round the coil with the cable in his hand. This operation gives it a twist, which becomes very perceptible as the cable is drawn in the act of being paid out into the sea. So long as this system of coiling the cable and paying it out from a *stationary* platform shall be continued, so long must the laying of the cable prove a difficulty, if not an impossibility, as it will be certain to kink and be cut in two by the twist given.

To remove the twist from the cable, let a circular rotating platform be erected on board the vessel for the reception of the coiled cable, similar to a turn-table on railways. In commencing to pay out the cable, draw the end on the outside of the coil, and let the platform rotate with it at a speed equal to that required to deliver the cable in the act of being paid out.

Unless some such method be adopted I feel persuaded the Atlantic cable never can be laid between Ireland and Newfoundland.

I am, Gentlemen, yours, &c.,
Robert Brisco.

Egremont, July 12, 1858,
Cumberland.

PROPOSAL TO SCOUR THE THAMES BY WATER FROM THE SEA.

Gentlemen,—For obvious reasons a collateral drain or canal by the side of, or even at some distance from the Thames, could never be accomplished, as has been proposed; and yet who can answer for the effect of a concentration of all the sewage of the metropolis?

I propose, therefore, to bring a stream of sea-water to London, to cleanse or scour the course of the Thames. The Brighton coast presents that most proximate for the purpose, and for obtaining the pure sea-water of the great Atlantic. Brighton itself, owing to the hilly regions of the South Downs, is not appropriate; but at Shoreham we have a tidal sea running up inland, and a gap in the South Downs by which I think my scheme could be accomplished. Here we could set up steam engines to pump up at flood, if required (which it probably will not be), when the sea-water fills the mouth of the stream, the pure sea-water, which it is proposed to bring to London by a canal or aqueduct built for the purpose. There is no interruption of any stream between Shoreham and London, except, possibly, one or more of the most insignificant size, unless it be the river Mole, which, having no objection to lowliness (as moles occasionally run under ground), could be readily passed by an aqueduct or otherwise, and the sea-water stream be brought into the Thames either through the river Wandle or, as I should prefer, parallel with that little stream, and just above it. There is somewhat of a gap in the Surrey hills near Reigate, and if not sufficient it would be a very easy matter to reduce the hill or tunnel it. It may be possible to avoid the Mole altogether.

I would begin the work near Shoreham by a sufficiently deep cutting lined with solid masonry, to be provided with a double sluice or floodgates as a precautionary measure. A small basin or reservoir might be of use to regulate the supply to the canal or channel, which should commence from it and run to a grand reservoir of 500 or even 1,000 acres. A site offers for this reservoir about Crawley, where the land lies comparatively level, but it is probably very considerably above the level of the Thames at the Wandle; so that we should have a descent or fall of the channel from the reservoir to the Thames. The water would be kept up by floodgates and sluices to let the new stream run as required. The great stream should be let run at half ebb, or sooner or later as might be found most advantageous, and it would act in aid of the Thames, sweeping through London twice in the twenty-four hours with pure and good sea-water. Sluices of the kind in use at Liverpool, in the docks there, and in Ramsgate harbour, would answer the purpose very well. No drains or sewers should be allowed on the banks or into the canal.

The work is too grand for anything but an undertaking of the Government, which might be assisted by voluntary subscribers, and the cost paid by the whole of the London district, north, east, south, and west, by a duty or rate upon houses, *pro ratâ* of value. I will with pleasure point out what further advantages and facilities occur to me, should you desire it.

I am, Gentlemen, yours, &c.,

G. G. V.

THAMES SEWAGE FOR MANURE.

GENTLEMEN,—Without offering an opinion how far Mr. Wright's plan, in your No. 1822, p. 30, may be at once practicable and profitable, I have a suggestion to offer for reducing the cost of the materials and increasing their effect. Instead of paying for charcoal, and burning the clay separately, one fire may do for both, using for the fuel tan bark refuse, which is largely burnt about Bermondsey to get rid of it, and would probably be supplied gratuitously in larger quantities than Mr. W.'s plan would require. It should be well mixed in with the clay in a damp state, but a sufficient quantity must first be dried to kindle the fire, after which it may be made continuous, the mixed clay and bark being thrown on damp, and drying by the fire below before it kindles.

If done in kilns, where it may be raked out below as fast as it is fully *charred*, that is its best condition for absorption. But to prevent its burning further in the receiver below, that must be made close, and opened only periodically near the bottom, to draw out what is quite extinguished. It would thus be a black bulky porous mass, dry and very friable, and much more penetrable throughout than any mixture of burnt clay with charcoal burnt separately; and the cost of it would not probably be much greater than that of burnt clay alone, as the bark, in burning the clay, would make the charcoal. But such a porous mass of charred clay and bark is not readily extinguished, retaining smothered fire for hours, enough to break out when exposed to the air. This would waste the charcoal and brick-burn the clay, bringing it to a much less effective condition for deodorisation and precipitation than when only charred black. It might, therefore, be drawn from the kiln into iron barges, dvided into three or four close compartments, in which it would be cooled by the surrounding water in passing up or down the river. But it should not be allowed to get wet, as that would much weaken its absorbent powers.

I am, Gentlemen, yours, &c.,

J. P.

ON THE STABILITY OF FLOATING BODIES.*

GENTLEMEN,—I am sorry that I am called upon to write any more on this subject. I hoped that I had already written all I had to say, but the last letter of your correspondent "Nauticus" requires a word or two of acknowledgment from me. He has proved me guilty of two errors:—1st, The dimensions of my grooved prism are not such as to endow that prism with the properties which I ascribe to it. 2nd. I have interpreted his proposition, that the centre of gravity of a deflected floating body moves about the instantaneous metacentre, to refer to the absolute, when it merely related to the relative, motion of that point.

I must acknowledge the justice of both these charges. But, with regard to the first, I think that your correspondent has gone considerably out of his way, and taken unnecessary pains in a matter which *hardly concerned him at all*, and which was of very little importance to anybody. This arithmetical error does not, as it happens, in any way affect the force of the argument with which it is associated. The horizontal dimensions of the prism required to be doubled, and my remarks on it are then quite correct. As to my misconception of his meaning, let him not be too severe against me on that account. His proposition, as I understood it, was manifestly false. But my interpretation went on the ground that it had a real meaning. With "Nauticus" himself for interpreter it becomes a mere meaningless truism. It is quite true that, when a floating body is deflected from its position of equilibrium, the centre of gravity has a relative motion about the metacentre, but so has any point of the said body about any other of its points. This is merely another way of saying that the body has angular motion. What antagonism is there in such a theorem towards the ordinary assumption that the centre of gravity rises and falls in a vertical line? Your correspondent gave it as antagonistic to this supposition; hence I naturally inferred that he meant the absolute, not the relative. If I had known his meaning I should have had no occasion to write on the subject; of which I now take leave, hoping that I may soon meet your correspondent and your readers again on some subject of more interest to them and to

Gentlemen, yours, &c.,

A MECHANIC.

* The absence of our correspondent from home has led to delay in the sending of this letter.—EDS. M. M.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

BUTLER, A. F. *Improvements in machinery for pulping coffee.* Dated Nov. 24, 1857. (No. 2941.)

This consists in supplying the coffee berries to the machine by placing them on an inclined surface, down which they roll until stopped by a roller at a short distance above the inclined surface, this distance being adjusted, by screwing, to regulate the speed with which it passes the berries onward. From the feeding apparatus the berries pass to the two pulping drums, which are mounted on parallel axes, and work up to within a short distance of each other. They are formed

with angular projections or teeth running from end to end, and one of the drums is considerably smaller than the other. The space between them is also capable of adjustment by screws. The berries are fed in between these drums at several points, but are prevented from descending at other points by suitable stops. When the berries have passed down between the drums the pulp will have been partially removed from them, but they are prevented from at once falling away from the drums by a surface which receives them, and they are thus kept up to the drums until they reach a point where the supporting surface is notched, so as to allow the berries to escape into a receiver.

WILLAN, R., J. ABBOTT, and D. MILLS. *Improvements in looms.* Dated Nov. 25, 1857. (No. 2943.)

This consists, 1. Of a mode of raising two or more shuttles. The patentees employ gearing or change wheels from the crank or tappet shaft, for giving motion to a pattern or tappet wheel, and also place on either of the shafts a cam or eccentric, which gives an easy alternate motion to an arm or rod, which is pushed by a projection on the pattern wheel, so that its lower end may come in contact with an ordinary shuttle box lever and raise the shuttles, a catch being employed to hold them so long as is necessary. 2. Of a method of disconnecting the tappets by means of gearing, so that the treddles may work at any required intervals.

MABERLY, F. H. *An improved general polishing machine or apparatus.* Dated Nov. 25, 1857. (No. 2944.)

This invention cannot be described without engravings.

MARTIN, A. and J. *Improvements in cleaning, and in preventing the formation of deposits and incrustations in, steam boilers.* Dated Nov. 25, 1857. (No. 2945.)

To clean a boiler, and to prevent the further formation of incrustations, the patentees introduce, by an apparatus which they describe, or otherwise, to every 45 or 55 galls. of water employed, a mixture composed of crystallised carbonate of soda, 1 oz. 7 drachms (apoth.), or, in lieu thereof, of 1 oz. 5 drachms of calcined carbonate of soda; wood ashes, sifted, 5 drachms; plumbago, 1¼ drachms. Instead of plumbago, 2¼ drachms of wood ashes may be added to the wood ashes already named; the whole is reduced to powder and mixed together. The plumbago may be replaced also by coke, pumice stone, &c. The mode of treating a marine boiler according to this invention is described at length in the specification.

BLINKHORN, W. *Certain improvements in machinery or apparatus for grinding and smoothing and for polishing glass.* Dated Nov. 26, 1857. (No. 2950.)

This consists in so arranging apparatus for grinding or smoothing glass, that, as the glass is carried alternately to and fro by a sliding or traversing table, it becomes submitted to the grinding or smoothing action of the "runner" in a transverse direction, so that every portion of the surface is perfectly ground. It further consists in the use of rubbers secured upon vertical shafts, and driven by suitable gearing so as to give the rubber a horizontal rotary motion round its own centre; or, when a number of rubbers are employed, round the driving centre.

RUSTON, J., and J. T. PROCTOR. *An improved arrangement of machinery for dressing grain.* Dated Nov. 26, 1857. (No. 2954.)

This consists in mounting the humeller blades, the brushes which work inside the screen, and the fan blades on one and the same shaft, the shaft being carried through the humeller case, the screen, and the case in which the fan revolves. The grain enters the humeller case, is carried forward therein, and delivered into the screen to be acted upon by the brushes; the grain falls from the screen and the blast from the fan is brought to bear thereon.

HIGHAM, J., and G. D. BELLAMY. *An improvement in the manufacture of soap.* Dated Nov. 26, 1857. (No. 2955.)

This consists in the addition of sulphate of lime to the other usual ingredients employed in making soap, in about the proportion of from 12 oz. to 6 or 8 lbs.

TAYLOR, W. B. *Improvements in driving looms for weaving.* Dated Nov. 27, 1857. (No. 2956.)

This consists in working all the working parts of power looms by a treadle, or by a hand wheel put in motion by the attendant of the loom, and connected to the crank shaft by multiplying gearing, by which means the patentee is enabled to increase the velocity of the crank shaft and other working parts of the loom, while the treadle or hand wheel remains at the speed best suited to the operator.

WRIGHT, S. B., and H. T. GREEN. *Improvements in apparatus used in the manufacture of bricks, pipes, and tiles.* Dated Nov. 27, 1857. (No. 2958.)

This refers to those machines where clay in a plastic state is expressed through orifices of a pug mill, etc., and consists, 1. In a manner of driving and regulating the speed of the cutter which cuts the clay into lengths, according to the speed at which the stream of clay is given out. 2. In an instrument for dividing a stream of clay from a pug mill, &c., into lengths. This instrument is a wheel, the ends of the spokes of which (near the circumference) are formed of wire cutters for dividing the clay; the portion of the spokes near the centre are of ash, so that they can spring sideways. This wheel is so placed that the wires pass through the stream of clay when the wheel is rotated, and the wheel is placed at such an angle that the cut of the wires is at right angles to the stream of clay. Above and below the stream there are guides fixed, which cause the wires while passing through the clay to deviate sufficiently from the plane of the wheel to cut at right angles to the stream of clay.

ELCOCK, W., and S. BENTLEY. *Improvements in elbows used for joining wrought-iron and other pipes or tubes, and in tools for manufacturing the said elbows.* Dated Nov. 27, 1857. (No. 2959.)

This invention cannot be described without engravings.

VANDELEUR, A. *Improvements in the construction of fire-places and passages for air of air furnaces, by which (without machinery) the intensity of the fire is increased, a saving of fuel effected, and the smoke consumed.* Dated Nov. 28, 1857. (No. 2961.)

The patentee claims a peculiar reverberatory arch, a peculiar fire grate for large furnaces, and a general arrangement for making the air pass down through the green coal. These cannot be described without engravings.

CHASSEPOT, A. A. *Improvements in breech-loading fire-arms.* Dated Nov. 28, 1857. (No. 2964.)

This invention cannot be described without engravings.

TINDALL, R. *Improvements in harpoon guns and ammunition.* Dated Nov. 28, 1857. (No. 2966.)

The muzzle of the improved gun is of smaller diameter than the rest of the barrel, the reduced part being to receive a ferrule contained in the centre of the harpoon head to be discharged. This ferrule has on each side a short barbed harpoon piece projecting in front of the collar. The line is attached to these pieces by a thimble. The gun is loaded with a long cylindro-conoidal ball, a short piece of the after end of which fits the bore of the gun. When the weapon is discharged the ball on emerging enters the ferrule, but, being caught therein by its shoulder, it carries away the duplex harpoon, and the line along with it. The cylindrical ball contains an expanding harpoon of a particular form. Another portion of the invention relates to the combination of a bomb or shell with the harpoon. Another modification of harpoon is comprehended. To render the harpoon gun accurate in aiming it is fitted with a self-adjusting sight

or elevation rod. The gun is supported in the usual manner upon a swivel fork, the arms or sides of which are prolonged upwards to a short distance above the upper surface of the gun's barrel. These prolongations are for partially supporting a moveable sight bar upon a pin passing through the top of them.

GRICE, F. G. *New or improved machinery for the manufacture of bolts, spikes, rivets, screw blanks, and other articles of like manufacture.* Dated Nov. 28, 1857. (No. 2968.)

This invention was described and illustrated at p. 49 of our last Number.

NICHOLS, J. *Improvements in machinery or apparatus used for sizing yarns or threads.* Dated Nov. 30, 1857. (No. 2970.)

Here the patentee places over the size trough two plates or discs, so as to form a kind of skeleton cylinder, and fixes them on a shaft driven by gearing. Each plate or disc is furnished with a set of hooks, one set being adjustable laterally, but not revolving independently of the disc, and the other set having round spindles to revolve in bearings or be stationary as required. Revolution one way when the hanks are on the hooks gives the necessary twisting and partial drying of the yarn, which is afterwards cleaned by passing through brushes. The hanks untwist of themselves, simply by being released, and are then taken off by hand, or slidden off by a guide to an apparatus for shaking and opening them.

DEACON, H. *Improvements in apparatus employed in the manufacture or production of caustic soda from liquors obtained in the manufacture of alkali, and applicable also to the manufacture or production of soap.* Dated Nov. 30, 1857. (No. 2971.)

This relates to an apparatus consisting of a tube or tubes reaching to, or nearly to, the bottom of the vessel containing the liquor, and extending a few inches above the level of the liquors so as to admit of such liquors entering freely at the lower extremity, that the boiling or effervescence may take place over the upper lip of the tube into the vessel, in place of over the sides of the vessel and becoming wasted.

KAYE, T. *Improvements in looms for weaving.* Dated Nov. 30, 1857. (No. 2972.)

This consists of apparatus for working or making sheds without the ordinary use of tappets or other similar modes heretofore practised.

BROOMAN, R. A. *Improvements in casks and other vessels for containing liquids.* (A communication.) Dated Nov. 30, 1857. (No. 2975.)

This consists in coating the insides of casks or vessels with an impermeable, tasteless, and non-absorbing composition. The composition is composed of hot liquid glue and powdered charcoal or sawdust.

CLARK, D. K. *Improvements in furnaces for promoting the combustion of fuel without smoke and the communication of heat, especially adapted to steam boilers.* Dated Nov. 30, 1857. (No. 2976.)

This relates, 1. To furnaces for effecting the complete combustion of fuel and the prevention of smoke. 2. To the application of descending flues in locomotive boilers for the better absorption of heat and the products of combustion. With respect to the furnaces, jets of steam are projected through air openings, in order to draw the air into the furnace, the action being like that of the blast in the chimney of a locomotive engine, and to diffuse and mix them with the combustible gases. With regard to the second part of the invention, the products of combustion issuing from the flue tubes of locomotives are led into and through descending smoke chambers or flues, after passing through which they ascend into the chimney, whence they escape in the usual manner. It also consists of methods of delivering air into furnaces under pressure—1st, by discharging air in jets through openings in the furnace, so that air may be drawn into the furnace with the jets of air; 2nd, in delivering the air in sheets by flat jet orifices.

GOODYEAR, C. *Improvements in the manufacture of buoyant fabrics, which are applicable to the manufacture of garments, carpets, rugs, cushions, mattresses, bags, and various other useful articles.* Dated Nov. 30, 1857. (No. 2977.)

Under one modification, two waterproof fabrics are combined so as to leave a number of vacant spaces or cells between them. The inner surfaces of these fabrics are furnished with a coating of flock, hair, cork cuttings or dust, wool, or other fibre, which will keep the surfaces apart, and the cells extended or bulged out, giving to the compound fabric something of the appearance of quilting. By this means the cells are prevented from collapsing, and render the compound cellular fabric buoyant. There are several arrangements included.

HOWARD, J. *Improvements in the construction of ploughs.* Dated Nov. 30, 1857. (No. 2978.)

The chief object here is to construct wrought-iron ploughs from a given weight of metal of greater strength than heretofore. The patentee forms the beam of bar iron, with a double flange at the upper edge near the point; and this flange he tapers off at its opposite ends. He also constructs the frame of the plough of bars of iron, either ribbed or plain. Between these wrought-iron bars, which form a kind of skeleton frame, he inserts the plough beam and the share neck or lever, and connects them to the beam and to each other, so as to ensure a proper amount of stiffness for the frame.

COUY, J. B. *Improvements in the manufacture of manure, and for the disinfection of animal and vegetable matters.* Dated Nov. 30, 1857. (No. 2980.)

This consists in the application of the residues arising from the distillation of Scotch boghead coal, either in small pieces or in powder, to the manufacture of manure, and to the disinfection of blood, flesh, fæcal matters, urine, residues of the distillation of alcohol, &c., and to the disinfection of gas.

YOUNG, J. *Improvements in measuring liquids.* Dated Dec. 1, 1857. (No. 2982.)

The form of the measure may be varied, but that preferred is an egg shape, with an opening at the top, into which is inserted a glass tube graduated into inch divisions. The liquid to be measured is admitted and runs off at the bottom by means of a three-way cock.

HIPKISS, R., and W. OLSEN. *Improvements in lubricating shafts and axles and other articles requiring lubrication.* Dated Dec. 1, 1857. (No. 2984.)

This consists in inserting in the journals of the shaft, axle, &c., pieces of wood, which, by the absorption of the oil, become impregnated therewith, and maintain the lubrication for a considerable time when the supply of oil is irregular or deficient.

LANE, D. *Improvements in lighting, regulating, and extinguishing street and other gas lamps, by means of electricity.* Dated Dec. 1, 1857. (No. 2985.)

This relates to the lighting of street lamps by a portable battery, and to regulating or extinguishing them by a train of wheels and a spring connected with the gas tap of each lamp, and capable of being set in motion by means of the battery.

THOMPSON, T. J. *Improvements in apparatus for lighting railway trains with gas.* Dated Dec. 1, 1857. (No. 2986.)

This relates to the use of compressed gas for lighting railway trains, and consists of, 1. A self-adjusting apparatus for reducing the pressure of the gas from a high pressure to a standard low pressure before entering the pipes of the carriages. 2. A coupling apparatus for conveying the gas from one carriage to another. 3. Mechanical arrangements for keeping the lights in carriages supplied with gas when they are detached from a train. 4. A method of filling the train gas-holders at different railway stations.

SHEPARD, E. C. *Improvements in magneto-electric machines.* Dated Dec. 2, 1857. (No. 2987.)

This apparatus is composed of several permanent magnets, with their ends placed in the planes of several vertical circles, and between any two of which circles is mounted a wheel having a series of helices or coils of insulated wire fixed on its periphery, so that when the wheel revolves it shall cause the helices to pass between the sides of the ends of the magnets composing the circles, for creating indirect electric currents.

SUMMERS, J., and D. WORMALD. *Improvements in machinery for manufacturing clog irons and heels and tips for boots or other coverings for the feet.* Dated Dec. 2, 1857. (No. 2988.)

This consists in machinery for bending rods of rolled iron around a block of the form required to produce a clog iron, or a heel, or tips for boots, &c. It cannot be described without engravings.

ECCLES, J. *Improvements in drying and colouring or ornamenting bricks, tiles, pipes, and other articles made of plastic earths.* Dated Dec. 2, 1857. (No. 2989.)

These relate, 1. To drying bricks, tiles, pipes, &c., preparatory to burning, and consist of a flue or a series of channels supplied with water or steam pipes, arranged within a cover or guard having perforations to allow a free passage of air to or from the channels, the articles to be dried being placed on each side and on the top of the perforated cover or guard, so that air passing to and from it may freely circulate amongst them. 2. To ornamenting such articles, and consist in employing "fire-brick earth" and "pipe clay" as a basis of the colour with which the article is coated previously to being burned.

BIRD, W., R. ASHTON, and T. BIRD. *Improvements in looms and pickers for looms.* Dated Dec. 2, 1857. (No. 2991.)

This consists in coupling at each end of the loom two or more picking sticks or levers, by means of straps, &c., and so operating them that the shuttles will have a direct parallel motion, without the ordinary picker spindles, check straps, box ends, springs, or studs, the pickers working simply in the boxes. The pickers are made of bone, horn, &c.

FOWLER, J., and W. WORBY. *Improvements in apparatus used when ploughing, tilling, or cultivating land.* Dated Dec. 2, 1857. (No. 2994.)

Here, when using two upright drums driven by steam or other power, such drums are sometimes geared together; but one of the drums may run freely. These work with drums or pulleys fixed at a distance. The endless rope takes turns around both the two upright drums, and around the pulley or drum at a distance. The ploughs, &c., are arranged to be attached to the rope, and they carry apparatus for taking up the slack of the same.

FRANCIS, J., and C. MANBY. *Improvements in the manufacture of waggons and other vehicles, applicable to the transport of troops and military and other stores on land and water.* Dated Dec. 2, 1857. (No. 2995.)

Here the bodies of carriages are made of corrugated sheet metal. Other features are included which cannot be described without engravings.

PARKES, A. and H. *Improvements in the manufacture of sheathing metals.* Dated Dec. 2, 1857. (No. 2996.)

This consists in adding phosphorus to copper or its alloys in the proportion of 8 oz. to each 100 lbs. Magnesia is to be added in the same way, and in some cases mercury.

LIVESEY, J. *Improvements in the manufacture of pile fabrics, and in the machinery employed therein.* Dated Dec. 2, 1857. (No. 2997.)

This refers to pile fabrics made on lace machinery, and consists in an arrangement of pile-forming instruments in combination with a method of working the ground threads, to cause the loops or tufts of pile to fall to the right or left as desired, by which means the patentee is enabled to form designs of uncut and cut pile fabrics.

BOUSFIELD, G. T. *Improvements in collapsible boats.* (A communication.) Dated Dec. 3, 1857. (No. 2999.)

The patentee constructs a boat so that there are at least four straight lines in her outer surface, each of which departs from a point at or near the meeting of the stem and stern pieces with the keel, and thence rises diagonally upwards and towards the midship section of the boat, until it reaches nearly to the gunwale. The upper terminations of these lines are to be united on each side of the boat by other lines running parallel to the gunwale, or nearly so, or to the keel; and from the points of junction of these lines other lines are to be drawn vertically upwards, or nearly so, till they reach the gunwale. There are by preference at least eight sections that are bounded by the lines above described, and by the gunwale, the stem, stern, or keel. These sections are attached to each other, and to the stem, stern post, and keel, by hinges, and thereby constitute a boat capable of being expanded, or of being shut up so as to occupy a small space.

HAZARD, R. *Improvements in a self-acting reclining chair or couch.* Dated Dec. 3, 1857. (No. 3000.)

This consists in framing the arms and legs or supports together, fixing proper centres to the same on which to hang the seat and back of the chair or couch, by joints or otherwise. By this arrangement the seat and back of the chair or couch will assume any angle of inclination desired by the sitter, or any degree desired from the perpendicular to the horizontal. The whole can be folded up or packed for carriage, &c.

SLACK, E. *Improvements in the treatment, application, and use of wheat and other grains and amylaceous vegetable substances.* Dated Dec. 3, 1857. (No. 3001.)

Here, the unground grain, &c., is primarily subjected to the chemical action of acids and alkalies, as well as to that of dextrine solution and other saccharine matters. After this the grain, &c., is washed, dried, and ground. Grain, &c., treated in this way may be used as an article of food, and in particular as a substitute for arrowroot.

HENWOOD, C. *An improved arrangement of galvanic battery suitable for medical purposes.* Dated Dec. 3, 1857. (No. 3003.)

The patentee takes plates of two metals, one electro-positive, and the other electro-negative to the other, and arranges such plates in pairs, and unites the pairs to form a chain or belt in a manner which cannot be described without illustrations.

PARSONS, W., and J. ATTREE. *An improved cock or tap and flushing apparatus.* Dated Dec. 3, 1857. (No. 3004.)

This invention was described and illustrated at page 57, No. 1823, of the present volume.

BUCHANAN, J. *Improvements in smoke-consuming apparatus, applicable to boiler and other furnaces.* Dated Dec. 4, 1857. (No. 3005.)

This consists of machinery which allows a regulated quantity of air to enter the furnace and come in contact with the gases arising from the fuel. The machinery consists of two parts; the one attached to the furnace doors is self-acting, the action being obtained by opening and shutting the doors; the other is a new arrangement of the furnace bars. The former allows a larger or smaller quantity of atmosphere to pass into the furnace, a larger quantity immediately after firing, which is gradually diminished as the fuel is consumed; the latter allows air to pass freely at all times into the furnace; it prevents the bars from "clinkering," consequently the doors do not require to be opened for slicing, and in ocean-going steamers furnaces need not be burned down when sponging or cleaning the flues at sea.

RIPLEY, A. *Improvements in mills for grinding myrabolams, valonia, bark, and other similar substances.* Dated Dec. 4, 1857. (No. 3006.)

The inventor claims the arrangements of the fluted or toothed roller and breastplate working close to each other, with the teeth or flutes set in the opposite way, as described.

RUBERY, J. *Certain improvements in the manufacture of umbrellas and parasols, and in the application of a new condition of material to the production of some of the parts thereof, that has not heretofore been used for that purpose.* Dated Dec. 4, 1857. (No. 3009.)

This cannot be described without engravings.

D'HELLE, J., and A. V. DE WARESQUIEL. *Improvements in railway rolling stock.* Dated Dec. 4, 1857. (No. 3010.)

This consists, 1. In providing carriages with an arrangement which, for the loading and unloading of carriages, may supersede the use of the ordinary turn tables. 2. In giving to each wheel of the carriages its proper axle, independent of those of the other wheels.

GRIMARD, J. *Improvements in watches, and in the means of or for winding up and setting watches.* Dated Dec. 4, 1857. (No. 3012.)

This consists chiefly in the substitution of a main spring in which the box fuzee and ordinary appendages are wholly dispensed with.

STANDRING, W. *An improved throstle and mule spring for the under clearers of spinning machines.* Dated Dec. 4, 1857. (No. 3013.)

This consists in substituting in place of the metallic steps hitherto employed in spinning machines a piece of sheet cast steel, hardened and tempered so as to answer the purpose of a spring and step in one, the intention being to prevent the loosening and breaking of the step.

MORTON, A., and J. HOWDEN. *Improvements in obtaining motive power.* Dated Dec. 4, 1857. (No. 3014.)

The power due to the percussive impact generated by the steam flow to the cylinder is here said to be practically utilised and made to operate in the direct working of the engine, by using very large valves and steam ducts, which allow the steam to get suddenly into motion. It is then allowed to expand into a large space, which may be independent of the engine, or may be formed by causing the engine crank to pass the centre to a considerable extent prior to the admission of the steam to the cylinder. The eduction valve for the waste steam is opened more slowly than is usual, or is reduced in size so as to "wire-draw" the steam. Arrangements are also made for "cushioning" the piston, balancing the moving parts by weights, &c. Many other arrangements for modifying the construction and the working of locomotive, rotary, and other engines and boilers are likewise included in this invention.

MENNONS, M. A. F. *Improvements in lucifer matches.* (A communication.) Dated Dec. 5, 1857. (No. 3017.)

This relates to the preparation of matches with chlorate of potass, 2 parts; charcoal, 1 part; umber, 1 part: or, chlorate of potass, 1 part; sulphur, 1 part; umber, 1 part; made into a paste with size or glue. The wood is cut so as to leave the lower extremities adhering. The upper ends of the bundle of splints are then coated, and the lower end is covered with amorphous phosphorus. The matches are to be lighted by breaking them in half after being detached from the bundle, and then rubbing the two ends together.

MERCER, W., W. BODDEN, and W. HIGGINSON. *Improvements in certain parts of machinery for slubbing and roving cotton.* Dated Dec. 5, 1857. (No. 3018.)

This consists in a mode of connecting centrifugal pressers to the flyers. The presser is hinged to a projection near the upper part of the flyer leg, and clips round the lower end of the leg. The hinge of the presser is so constructed that the presser is prevented rising or falling, or falling off when the spindle stops; and the shape of the presser is such that the roving or slubbing is wound on tighter at the commencement than at the full bobbin. It is applicable to single or double pressers.

ASHEAD, T. S., and A. HOLDEN. *An improved self-acting combination of machinery for the grinding of carding engine rollers.* Dated Dec. 5, 1857. (No. 3019.)

This consists of machinery whereby a longitudinal in addition to the rotary motion is given to the rollers to be ground, and a lateral motion to the grinding surface; or in applying the longitudinal and lateral motions to the frame supporting the rollers while the grinding surface remains stationary; or in applying the longitudinal and lateral motions to the grinding surface while the rollers to be ground revolve in stationary bearings.

HENLEY, W. T. *Improvements in ropes and cables for telegraphic or other purposes, and in machinery used in the manufacture of such and other ropes and cables.* Dated Dec. 5, 1857. (No. 3020.)

These consist in making cables of strands formed of wire and cocoa-nut fibre, hemp, &c. These strands are made by laying threads of wire and vegetable fibre into a strand, having a central thread or core of hemp, &c. These strands are then laid round another and larger core into a rope. When used for submarine purposes, the core must be the ordinary conducting wire, coated with gutta percha, and covered with a serving of tarred yarn, instead of the soft hemp core, as before mentioned. The machinery cannot be described without engravings.

BRINTON, J., and J. CRABTREE. *Improvements in the preparation of weft yarn to be used in the manufacture of carpets and other pile fabrics.* Dated Dec. 5, 1857. (No. 3021.)

The patentees wind the yarn direct from the swift into a cop, and in so doing cause it to pass through suitable sizeing liquid, aided by rollers, by which it becomes more uniformly saturated before being formed on to the spools.

SINCLAIR, J. *Improvements in machinery or apparatus for cutting or dividing stone and marble.* Dated Dec. 5, 1857. (No. 3022.)

The patentee employs a straight saw or serrated cutting blade, or a blade having a smooth edge, with notches at intervals, for the admission of sand or cutting powder into the cut. This blade is fitted into a holder, so as to strengthen the blade, and dispense with the necessity of straining it, and is connected at each end to an oscillating link or lever, working on adjustable centres. The links are so arranged that when the one is in a perpendicular position the other will be at an angle. A longitudinal reciprocating motion is imparted to the saw, so as to give a horizontal cut, whilst a vertical or lifting motion is imparted to each end of the blade alternately for each stroke, to allow the sand and water to enter the cut freely at each stroke of the blade.

NEWTON, W. E. *Certain improvements in apparatus for laying submarine telegraphic cables.* (A communication.) Dated Dec. 5, 1857. (No. 3024.)

Here the cable is payed out from the vessel at a speed never less than, but properly regulated in proportion to, the speed of the vessel; and to effect this a paying-out apparatus is employed, consisting principally of drums around which the cable is conducted, and which are furnished with suitable breaks. The motion for paying out the cable is imparted to the drums by a steam engine.

HARRIS, J. *Improvements in signalling, and in apparatuses employed therein, part of which is applicable to the compression and exhaustion of air and other fluids.* Dated Dec. 7, 1857. (No. 3030.)

The patentee takes a cylinder with a piston rod and lever, an elastic diaphragm with a piston in a cylinder for striking upon a bell, or blowing a whistle, and a pressure gauge with words, letters, and figures on the dial thereof, and places them in the spectator's room, on a locomotive, on board ship, in a coal pit, or in any other situation. A similar cylinder, with piston, lever, diaphragm, and pressure gauge, is also placed in any part or parts where communications are to be made, an air-tight tube or pipe being employed to connect the apparatus. The pressing down of a lever which

is attached to the piston at either end rings the bell; and then by the working of the lever the needles or pointers on the pressure gauges tell off similar words, letters, or figures at both ends, and communication is thereby effected. He purposes signalling by means of either pressure or vacuum, or both in the same apparatus. The invention also consists in a new pump, so arranged that by turning a cock or valve it will either compress or exhaust air or other fluid. It is applicable for signalling by either semaphore or dial at great distances. Instead of cylinders, pistons, and diaphragms, the patentee sometimes uses elastic spheres or spherical-ended cylinders, as described in the specification of a patent granted to him 8th Jan., 1857. Other fluids than air may be used.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

WOODWARD, H. *A new or improved knife-cleaner.* Dated Nov. 26, 1857. (No. 2953.)

This consists of two parallel pieces of wood pressed together and coated on their interior faces with leather. The inventor attaches one piece to a table, and connects the second to the fixed piece by pins on the fixed piece passing through holes in the moveable piece. Coiled springs placed upon the pins and bearing against screw nuts on the tops of the pins press the moveable piece upon the fixed piece. A hopper is fixed on the moveable piece, which is filled with bath brick, &c., which passes through a hole in the moveable piece and is deposited between the two leather surfaces. The knife is inserted between the two surfaces and moved briskly backwards and forwards.

WHEELER, T. *Improvements in machinery or apparatus for cutting turnips and other roots.* Dated Nov. 27, 1857. (No. 2957.)

This relates to turnip cutters, root graters, &c., and consists in casting the side or end standards in one piece, and in constructing the top hopper of cast iron with suitable side apertures for the escape of the dirt. Also to the knives, and consists in making them of a gouged bell-mouthed shape, whereby a better cut is effected. Also to combining the knives of turnip cutters known as "Gardner's" with Moody's barrel, or with flat discs, whether used for double or single action, either vertically or horizontally. There are modifications included.

PEACH, B. *Sundry improvements in bedsteads, elastic bed bottoms, the seats of chairs, sofas, and other similar articles.* (A communication.) Dated Nov. 28, 1857. (No. 2960.)

This consists in using india-rubber bands or rings, or spiral metal springs, or straps of leather, cloth, &c. The under framework of the bedstead or seat is made with hooks to support the rings or bands employed, and between the rails of the framework hooked rods descend for the sacking on which the mattress rests. The hooks of these rods catch into the rings or bands, &c., and are supported thereby, thus producing an easy elastic structure.

PETERS, J. *Certain improvements in the machinery used in spinning.* Dated Nov. 28, 1857. (No. 2962.)

This consists in a flyer or spinning needle for spinning thread, at the same time it is wound on a reel or cylinder. The flyer is composed of a cylindrical box, containing the thread to be spun. Upon the top of the lid of the box is fitted a small tapering spindle for twisting the thread. The box is fitted to a pivot, which rotates on a socket and guide. On the axis is a small pulley placed in connexion by cords, with wheel gearing, by which a rapid rotary motion is given to the flyer, so as to twist the thread as it is drawn or wound on a reel or cylinder resting and rotating upon another cylinder actuated by the wheel gearing. The thread as it is drawn from the flyer passes through an adjustable guide, and also between two rollers.

MENNONS, M. A. F. *An improved "tell-tale clock" or time keeper.* (A communication.) Dated Nov. 28, 1857. (No. 2963.)

This consists in the application to a clock, &c., of a mechanical arrangement which causes a trap to open when desired, and maintains it in this position as long as required. The opening and closing are effected by catches and triggers which act on a lever fixed to the dial of the clock. The opening of this trap permits the introduction of a supply of numbered markers, &c., which fall into receptacles fixed to a horizontal circular plate worked by the same escapement as the clock. These receptacles are numbered so as to correspond with the figures on the dial. In this way the markers fall into the receptacles which correspond respectively to the hours at which they were introduced. This apparatus acts as a check on the going out or coming in of workpeople, &c.

BINNS, W. *Certain improvements in the treatment and application of surcharged or superheated steam.* Dated Nov. 28, 1857. (No. 2965.)

The object here is to superheat the steam by passing it through pipes arranged in the flues of the boiler, and afterwards to deprive the steam of the excess of heat by causing it to circulate through tubes or chambers immersed in the water of the boiler. The steam, having given out its superfluous heat, which is employed as an auxiliary generator, enters the steam dome, and thence passes to the cylinder of the engine, which it enters in a comparatively dry state.

MASSEY, W. *Improvements in guides or conductors to be applied to machinery or apparatus employed for winding or coiling chains, ropes, lines, thread, wire, or other similar articles.* Dated Nov. 28, 1857. (No. 2967.)

This consists in applying to the above purposes the apparatus described in the specification of a patent dated 12th May, 1857.

GARDNER, J., R. LEE, and H. G. PEARCE. *Improvements for self-reefing sails.* Dated Nov. 30, 1857. (No. 2969.)

The inventors employ an arrangement of supplementary yards or rollers and sheaves in such manner that, when the top-sail yard is lowered down by the haulyards in the usual way, the revolving yard is turned on its axis by the unwinding of a rope or chain from the fast pulley on its centre, and the sail is wound round the roller as the yard descends.

FONS, J. P. DE LA. *Improvements in apparatus for retarding omnibuses and other carriages.* Dated Nov. 30, 1857. (No. 2973.)

A skid or pan is made in two parts; the upper part with a curved upper surface, on to which the wheel runs when the skid is used. This part of the skid has two lugs, one on either side at the back end thereof, between which the wheel enters. The skid has also two other lugs with holes through them corresponding with holes in the other part of the skid, which is formed to fit the part first mentioned. The skid has one end of a lever fixed to it, and it is attached to a drag chain. The lever at the other end comes conveniently to the foot board, so as to enable the conductor to depress such part of the lever by his foot when it is desired to lift the skid off the ground.

MONTEL, P. A. *An improved motive power.* Dated Nov. 30, 1857. (No. 2974.)

This is obtained from springs or blades of steel or iron which are supported at their extremities by wheels to which rotary motion is to be communicated, and also at their centre to a central wheel also fixed on the same axle. The action of the springs puts the central wheels and the axle in motion, which is kept up until brakes are applied to stop or reduce its speed.

NEWTON, A. V. *Improved machinery for cleaning carpets and other fabrics.* (A communication.) Dated Nov. 30, 1857. (No. 2979.)

The carpet is strained over a pair of rollers, and may be held at tension by a third roller having a traversing motion, the ends of the carpet being connected to form an endless web. Fixed to a cross bar is a series of elastic beaters, the lower ends of which are caught by revolving arms, and being suddenly let go the beaters will strike upon the suspended carpet, and beat out the dirt. A progressive motion is given to the carpet. Above the beaters, and extending across the machine, is a rotary brush, which is caused to act upon the carpet.

SOLOMON, S. *Improvements in umbrella, parasol, and walking-sticks or canes.* Dated Nov. 30, 1857. (No. 2981.)

These consist in making the bend or crook forming the handle by building up a series of parts on a piece of metal bent of the required form, and secured into the straight part of the cane or stick.

SPRAY, F. G. *Improvements in the manufacture of gunpowder.* Dated Dec. 1, 1857. (No. 2983.)

Here the saltpetre in a state of solution is, 1, placed in an open vessel, and boiled by perforated steam pipes, and, when cleaned, it is passed into a closed vessel and boiled *in vacuo*. 2. The ingredients for the gunpowder in a dry state are placed in a vertical vessel, furnished with steam jets or pipes projecting inwards. This vessel has a revolving shaft, with blades projecting horizontally therefrom, and passing between the jets or pipes, the blades being so curved or inclined as to pass the ingredients from the bottom of the vessel upwards as they revolve. Steam is next admitted, and the shaft with the blades is set revolving, the effect of which is to mix the ingredients; and when they are properly mixed the steam is turned off, and the powder is dried (while the blades are still revolving) by means of steam admitted into a jacket or coiled pipe passing around the vessel. It relates, 3. To the glazing, and consists in placing a second barrel upon a shaft in the interior of the vessel. This barrel may either revolve or remain stationary (as the outer one revolves), and the gunpowder is introduced into the space between the outer barrel and the inner barrel. By this means a greater frictional or glazing surface is obtained, and the glazing is effected in a shorter space of time than heretofore.

HETHERINGTON, J. *A new or improved manufacture of the bowls of castors for furniture.* Dated Dec. 2, 1857. (No. 2990.)

The inventor forms them in two pieces, by casting or stamping, the two pieces having a cup-like shape, such that when their edges are joined together they constitute a hollow bowl. A rod is cast on one of the cups, rising from the middle of the inside. A hole is formed in the other cup through which, when the two are put together, the rod projects, thus forming a hollow bowl with a solid stem or axis running through.

THOMSON, W. *Improvements in machinery or apparatus for propelling ships or vessels.* Dated Dec. 2, 1857. (No. 2992.)

This consists in fitting in the stem of the ship folding or hinged propellers. They are each made in the form of a pair of semicircular discs, hinged one on each side of a longitudinal reciprocating bar which works out into the water, through the stern or quarter of the ship.

MOIREAU, C. J. M. *A composition to be used as a substitute for bees' wax.* Dated Dec. 2, 1857. (No. 2993.)

This consists in the use of grease, vegetable, or animal matters mixed with resin. The inventor makes this mixture in certain determined proportions varying for the greasy substance or resin employed. The product obtained may be afterwards bleached.

CICERI, L. F. E. *Improvements in the preparation of white as a basis of colour.* Dated Dec. 3, 1857. (No. 2998.)

This consists in mixing plaster of paris with zinc white or white lead, &c., and alum.

REEVE, J. *Improvements in propelling vessels.* Dated Dec. 3, 1857. (No. 3002.)

This consists in propelling vessels by the direct action of a steam piston upon the propelling surface, "but in which the motion is multiplied, so as to increase the rate of motion much beyond that of the speed of the steam piston, by means of a combination of levers, or, it may be, simply by one lever."

HAMILTON, J. *Improvements in the construction of strained wire fencing for dividing fields, parks, and pleasure grounds.* Dated Dec. 4, 1857. (No. 3007.)

These consist in the use of iron rods to form the top rail, instead of the top wire, each rod having a male screw at one end, with a collar at a suitable distance from the end, and a female screw at the other end. The inventor passes the male screw through a hole in the top of a post, until the collar comes in contact with the side of the post, the screw end protruding sufficiently to allow the female end of another rod or rail to be screwed to the other side of the post.

DEACON, H. *Improvements in the manufacture or production of soda and potash.* Dated Dec. 4, 1857. (No. 3008.)

This consists in separating sulphuric acid from the solutions of the alkalies by adding clay or lime.

SEWERS, S. H. *An improved powder for dusting turnips, and machinery for distributing the same, which may be employed for similar useful purposes.* Dated Dec. 4, 1857. (No. 3011.)

This consists, 1. In the combination of the following ingredients—1 part gypsum, 2 parts ashes, and 1 part soot, saturated with ammonia. 2. In a machine consisting of a hopper for containing the powder, communicating with a cylindrical chamber, provided with a slot opening extending throughout the entire length of the lower portion thereof, through which the powder is distributed by the action of a cylinder furnished with brushes, and caused to revolve through tooth and pinion gear, in connexion with the axle of the running wheels, the said cylinder being provided with trap openings for regulating the discharge of the powder to the number and the width of the rows to be operated upon.

OSTROROG, S. J. C. *A wind musical instrument.* Dated Dec. 5, 1857. (No. 3015.)

This has reference to those instruments in which the notes are produced by the vibration of metal tongues when acted upon by currents of air, and consists of two cases fitting into each other, the front case containing the sonorous mechanism, valves, and key board, and the posterior case the bellows and reservoir for supplying the air.

CALDWELL, W. *An improved fluid meter, which may be used as a motive-power engine.* Dated Dec. 5, 1857. (No. 3016.)

Two double-action pistons and a double set of valve gear of a peculiar form are enclosed and work within a metal case, square in the centre and cylindrical at each end. A partition which divides the case into two is cast therewith. A cover is fitted on to the head of the upper cylinder, which has a gland opening therein, through which a piston rod works to actuate the index pointer when used as a fluid meter, or to give motion to a crank through a connecting rod when used as a motive-power engine. There are several minor arrangements which it is unnecessary to describe here.

HILEY, D., P. HILEY, W. HARGREAVES, and E. HALEY. *Improvements in power looms for weaving worsted, cotton, silk, woollen, and other fibrous substances.* Dated Dec. 7, 1857. (No. 3025.)

Here a shuttle is constructed with two bobbins upon one spindle, one bobbin throwing out the thread on one side of the shuttle, and the other throwing out the thread on the opposite side, the bobbins being placed back to back upon one spindle. It also consists of two sharp instruments attached to the loom, which will cut off the thread pick by pick, or any given number of picks, and

are made self-acting by means of levers, wheels, and tappets. Also of a waved reed or slay, by which the inventors weave any kind of waved stripes. By the use of the above sharp instruments they can weave different colours with one shuttle without stopping the loom.

PROVISIONAL PROTECTIONS.

Dated May 29, 1858.

1218. J. Schloss, of Cannon-st. West, merchant. A so-called book-clasp or improved fastening of books, being also applicable to pocket-books, ledgers, blotting-cases, and similar articles, where locks, bolts, or clasps are employed.

Dated June 8, 1858.

1290. W. Clark, of Chancery-lane. The manufacture or preparation of extract of Peruvian guano. A communication from A. Cochet, of Paris.

Dated June 10, 1858.

1320. W. Davis, wood turner, of Birmingham. Certain improvements in the tangs of awls, also in the mode of manufacturing awl-blades or similar articles, and likewise in the stocks or pads for holding the same.

Dated June 12, 1858.

1338. W. Clark, of Chancery-lane. A new treatment or preparation of a vegetable product and its application as a fibrous or textile material. A communication.

Dated June 18, 1858.

1377. W. Blizzard, of Notting-hill. Improvements in india rubber, gutta percha, and drying and other oils.

Dated June 24, 1858.

1425. P. Griffiths, of Burnley, engineer. Improvements in the manufacture of shaft couplings.

1427. J. Robinson, of the East India-road, surveyor. Improvements in applying and adapting water-closets to ships, so as to ensure the safety and more perfect ventilation of the same.

1429. J. H. Johnson, of Lincoln's-inn-fields. Improvements in machinery or apparatus for making bolts and rivets. A communication.

1430. R. Pickering, of Lockerbie, Dumfries, N.B., railway inspector. Improvements in apparatus for communicating signals from one part of a railway train to another.

Dated June 25, 1858.

1433. C. Nightingale, of Wardour-street, Soho, bedding manufacturer. Improvements in apparatus applicable to curling and spinning machines for horse-hair and other materials.

1435. P. R. Smith, of Paris. Improvements in fire-arms and ordnance, and in the projectiles to be used therewith.

1437. J. Westwood, of Poplar, ship builder. Improvements in the plating of ships and floating and other batteries, to render the same shot-proof.

Dated June 26, 1858.

1439. P. M. Crane, of Ireland, manager. Improvements in the manufacture of fuel from peat.

1441. W. L. Tizard, of Mark-lane, brewers' engineer. An improved method of treating brewers' and distillers' malt or grist.

1443. W. Woofe, of Gloucester, agricultural implement maker. Improvements in implements for paring, hoeing out, and clearing land, and for depositing seed.

1445. T. V. Flinn, of Edward's-place, Camberwell-green, painter and glazier. Improvements in sash-bars, for the purpose of drainage.

1447. E. Pinchon and W. R. Harris, both of France, merchants. Improvements in machinery for manufacturing healds or harness used in looms for weaving.

1449. W. H. Preece, of Bernard-street, Primrose-hill, and J. L. Clark, of Adelaide-road, Haverstock-hill. Improvements in electric telegraphs.

Dated June 28, 1858.

1451. I. Hammond, of Winchester, gun maker. Drawing the cartridge case from the barrel of a breech-loading gun.

1453. J. Luis, of Welbeck-street. An improved machine for reaping corn. A communication.

1455. G. Morris, of Regent-street, hosier. An improvement in shirt and other collars.

1457. C. W. Siemens, of John-street, Adelphi. Improvements in cleansing tidal rivers.

1459. W. E. Newton, of Chancery-lane. A new mode of applying engraved plates, or electrotype, or other substitutes for such plates to the cylinders of printing presses, and of applying other parts of such presses in combination with the cylinders to enable perfect impressions to be taken from the cylindrical surfaces of the plates. A communication.

Dated June 29, 1858.

1461. F. A. Calvert, of Manchester, engineer. Improvements in machinery for cleaning and preparing cotton, wool, and other fibrous materials.

1463. J. Shaw, of Manchester, mechanic. A machine to manufacture square paper and other bags.

1465. J. Harcourt, ironmonger, of Birmingham. An improved adjustable spindle for locks and latches.

1467. W. Baker, of Albert-villas, Holloway. Improvements in constructing covered ways for the passage of sewage on the banks of rivers.

Dated June 30, 1858.

1469. P. P. C. and J. B. Barrat, of Paris. Improvements in machinery for digging, reaping, mowing, and performing certain agricultural operations, and for cutting drains and excavating, partly applicable to arrangements for communicating motion for other purposes.

1471. S. Fattorini, of Milan, optician. An universal meridian applicable to mathematical, geometrical, and precise instruments.

1473. W. Capstick, of Liverpool, wheelwright. Improvements in wheels for carts or vehicles to run on common roads.

Dated July 1, 1858.

1475. H. G. Pearce, of Liverpool, master mariner. Improvements in reefing the sails of navigable vessels.

1477. W. Clark, of Chancery-lane. Improvements in gridirons. A communication from Messrs. Poirot, Bouilliant, and Co., of Paris.

1479. T. Blinkhorn, of Spalding, engineer and millwright. Improvements in the construction of steam boilers and engines.

1481. H. W. Wimshurst, of Dalston, gentleman. Improvements in manufacturing sheet metal.

Dated July 2, 1858.

1483. C. F. Vasserot, of Essex-st. An improved wire conductor for electro-magnetic machines. A communication from L. B. S. Charrier de Sainneville, of France.

1485. F. Richmond and H. Chandler, both of Salford, agricultural implement makers. Improvements in machines for cutting hay, straw, and other vegetable substances.

1487. P. R. Hodge, of Regent's-park, civil engineer, and G. Spencer, of Cannon-st. West, civil engineer. Improvements in the means of preventing or regulating the recoil of springs used in railway engines, carriages, and station buffers.

1489. W. Sellers, of Philadelphia, U.S. Improvements in machinery for turning metal shafting or bars and cylindrical rings and cutting screws.

1491. J. L. Clark, of Haverstock-hill. An improvement in electric telegraph cables or ropes.

Dated July 3, 1858.

1493. T. Scott, of Drummond-street. Improvements in dressing, separating, and cleaning seeds, and in apparatus for these purposes.

1495. S. Lees, of Bury, engineer, and J. Jaques, of Preston, engineer. Improvements in the means for generating steam and economising fuel.

1497. T. Restell, of New Kent-road, engineer. Improvements in breech-loading fire-arms and ordnance, and in ammunition to be used in breech-loading arms.

1499. J. Chisholm, of Bermondsey, manufacturing chemist. A method of disinfecting and deodorizing or treating sewage and other matters and structures and places.

1501. O. Sarony, of Scarborough, photographic artist. Improvements in treating and colouring photographic pictures.

1503. A. V. Newton, of Chancery-lane. Improvements in soldering irons. A communication.

1505. E. Haeffely, of Kearsley, chemist. Improvements in recovering oxides of manganese from products arising out of the manufacture of chlorine, and in raising commercial manganese to higher oxides.

Dated July 5, 1858.

1507. R. A. Brooman, of 166, Fleet-st., London, E.C., patent agent. Improvements in the manufacture of cast steel. A communication.

1509. J. Hodgkinson, of Atherton, baker. Certain improved machinery or apparatus for kneading dough in the manufacture of bread.

1511. M. Nelson, of New York, U.S. Improvements in propellers for vessels.

PATENTS APPLIED FOR WITH COMPLETE SPECIFICATION.

1558. W. Northen, of Lambeth, potter. The application of stoneware or earthenware, coloured or plain, to improved and original designs. Dated 12th day of July, 1858.

1562. M. A. F. Mennons, of Paris. Improvements in the construction of fire engines and similar apparatus. A communication. Dated 12th day of July, 1858.

NOTICES OF INTENTION TO PROCEED.

(From the "London Gazette," July 20, 1858.)

452. C. C. C. de St. Germain. "Starch."
465. G. Redford. "Bullet cartridges."
471. J. P. Budd. "Smelting or refining."
495. G. S. Andrews. "Washing machines."
496. A. Porecky. "Umbrellas and parasols."
500. T. Thompson. "Cheese-vats."
502. W. Pearson. "Washing machine."
511. S. T. Parmelee. "Boots and shoes."
514. J. Jameson. "Compressing and expanding fluids."
528. J. Hamilton. "Propelling vessels."
529. A. Wallis and C. Haslam. "Bearings."
530. J. F. Empson. "Buttons."
542. W. S. Clark. "Gunpowder canisters." A communication.
545. T. C. Hine. "Gas lighting and ventilating."
551. R. Glanville. "Condensing steam engines."
556. T. Suffield. "Pumps for ships' purposes."
581. R. Mills. "Washing machines."
625. W. S. Clark. "Railways." A communication.
631. F. Haeck. "Pumping beer, wine, vinegar, oils, or other liquids containing acids or oily matters." A communication.
637. R. A. Brooman. "Weighing machines." A communication.
639. P. H. G. Bérard. "Waterproofing by concentrated collodion."
667. E. A. Jacquin. "Plates for printing." A communication.
719. W. Clark. "Water tank." A communication.
720. W. S. Clark. "Grain and grass harvesting machines." A communication.
840. W. Carron. "Moulds for casting nails."
854. H. Edwards. "Trousers or other wearing apparel."
1028. C. Botten, jun., and N. F. Taylor. "Measuring and regulating the flow of gas and fluids."
1034. A. V. Newton. "Manufacturing paper." A communication.
1041. W. H. Ogden. "Pumps."
1068. J. West. "Water taps and branches."
1112. H. Walker. "Needles."
1320. W. Davies. "Tangs of awls, stocks, and awl blades."
1372. J. Allardice and W. Miller. "Gaseliers."
1402. W. E. Newton. "Felt." A communication.
1426. G. Collier. "Stretching and drying woven fabrics."
1429. J. H. Johnson. "Making bolts and rivets." A communication.
1438. J. Taylor. "Horse hoes, applicable also to drills."
1443. W. Woofe. "Paring, hoeing out, and clearing land, and for depositing seed."
1499. J. Chisholm. "Disinfecting and deodorising or treating sewage."
1503. A. V. Newton. "Soldering irons." A communication.
1558. W. Northen. "Stoneware or earthenware."
1562. M. A. F. Mennons. "Fire engines." A communication.

The full Titles of the patents in the above List can be ascertained by referring back to their numbers in the Lists of Provisional Protections previously published.

Opposition can be entered to the granting of a Patent to any of the parties in the above List who have given notice of their intention to proceed, within twenty-one days from the date of the Gazette in which the notice appears, by leaving at the Commissioners' office particulars in writing of the objection to the application.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

1566. J. H. Tuck.
1577. R. Yeates.
1586. T. Sadleir.
1587. F. Burke.
1593. J. B. Pascal.
1599. W. Pidding.
1608. W. C. Thurgar.
1614. W. Smith.
1620. A. E. L. Bellford.
1622. V. Scully.
1624. R. and J. Martin.
1627. J. G. Lawrie.
1628. P. Bertinetti.
1629. D. and T. R. H. Fisken.
1633. J. H. Johnson.
1634. J. H. Johnson.
1642. J. H. Johnson.
1668. A. Achard.
1684. B. Bailey.

LIST OF SEALED PATENTS.

Sealed July 16th, 1858.

2798. W. F. Batho and E. M. Bauer.
88. G. A. Tremeschini.
89. B. B. Wells.
93. C. V. Corvin.
95. R. Martin.
96. T. Heppleston.
101. R. A. Brooman.
190. J. Sholl.
885. G. Smith.
1017. W. Wallis, W. Langford, and J. Slack.
1110. G. M. Casentini.

Sealed July 20th, 1858.

100. C. Rishworth.
107. T. Ivory.
120. W. Basford.
128. J. Johnston.
154. W. Spence.
674. T. Steven, T. Reid, and T. Frew.
694. A. P. Dudley and N. Brough.
1148. A. P. Price.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned above.

NOTICE TO CORRESPONDENTS.

Articles and Correspondence designed for insertion in the ensuing Numbers of the *Mechanics' Magazine* must reach the Office by the Tuesday of each week, at the latest. It is highly desirable that they should be forwarded earlier if possible.

CONTENTS OF THIS NUMBER.

LONDON: Printed and Published by Richard Archibald Brooman, of 166, Fleet-street, in the City of London; Sold by A. and W. Galignani, Rue Vivienne, Paris; Hodges and Smith, Dublin; W. C. Campbell and Co., Hamburgh.

Mechanics' Magazine.

No. 1825.] SATURDAY, JULY 31, 1858. [PRICE 3D.

Edited by R. A. Brooman and E. J. Reed, 166, Fleet-street, London, E.C.

EASTWOOD AND LLOYD'S HYDRAULIC SHEARING PRESS.

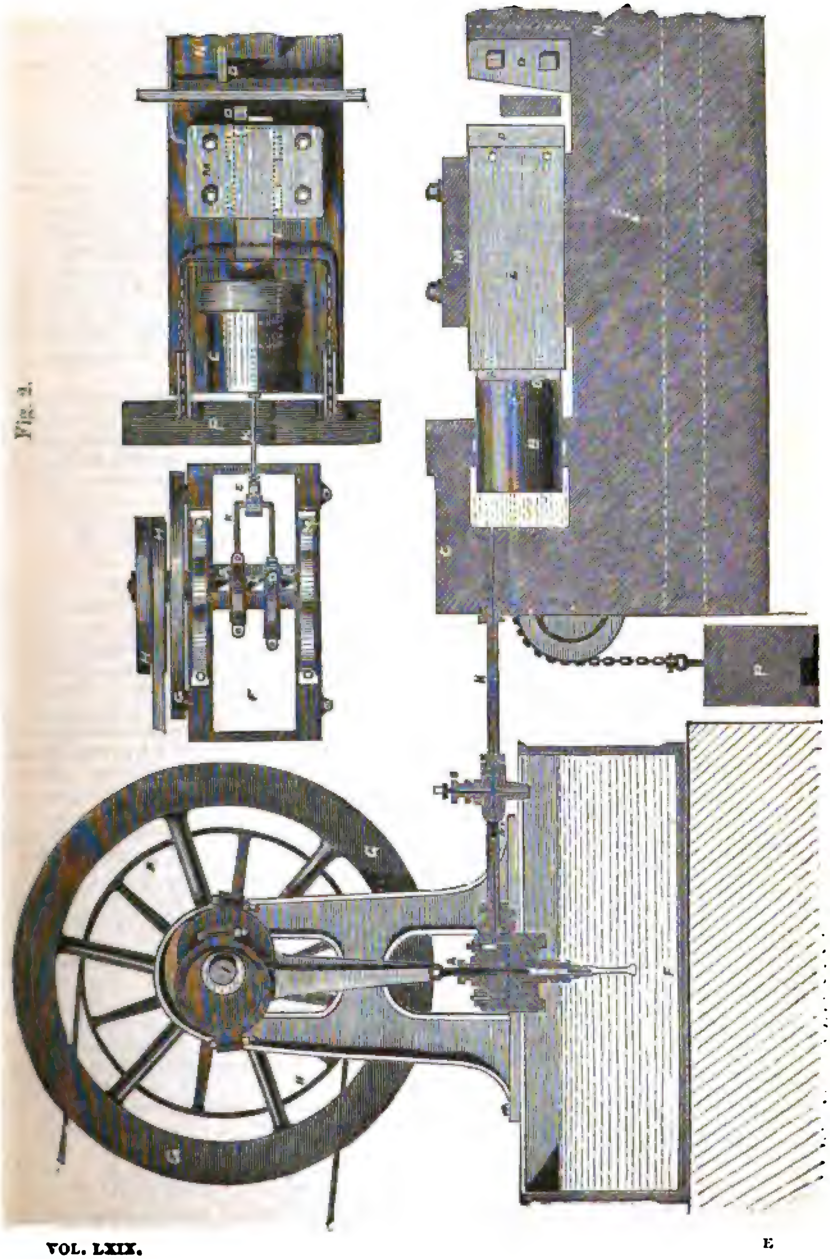


Fig. 2.

Fig. 1.

EASTWOOD AND LLOYD'S HYDRAULIC SHEARING PRESS,

BY MR. CHARLES LITTLE, OF DERBY.* .

In the manufacture of bars or forgings from scrap iron one of the chief difficulties to be overcome is the cutting up of heavy scrap of large section, such as railway tyres, axles, engine frames, rails, ship's knees, &c., into pieces sufficiently small for the furnace, without their having to be heated in a furnace or smith's fire before they can be safely cut up by ordinary shears; such an operation involving a great loss of fuel, time, and labour, and consequently making a large item in the cost of manufacture. Several machines are at present in use for shearing scrap, but they are found to have some disadvantages either from too great first cost, weight, expensive foundations, liability to get out of order from the wear and tear of their working parts, or from their liability to breakage from improper management; this is frequently the case with the common lever shears, which travel so rapidly that there is barely time to place a large piece of iron near enough to the fulcrum before the shear descends, and from the angular position of its cutting edge at the time forces the bar to the extremity of the cutters, sometimes breaking the shears, and not unfrequently injuring the attendant; this is most liable to occur when the iron is of a rounded section, or when it is painted or greasy. Another difficulty arises from there being no means of limiting or measuring the power of the ordinary machines when driven by cranks, cams, or eccentrics; and in case of accident the momentum of the flywheel prevents the machinery stopping suddenly; and if it is desired to strengthen the machine, this can be done only by a great increase of weight, necessarily requiring much more power for driving the machine.

Most of these difficulties have been overcome by the simplicity and peculiar construction of Mr. Eastwood's Hydraulic Shearing Press, forming the subject of the present paper, which is shown in Figs. 1 and 2, preceding page. Fig. 1 is a longitudinal section, and Fig. 2 a plan on a smaller scale. This machine is so strong and self-contained, that there is little or no risk of breakage as in the ordinary machines; and large and unshapely pieces of iron can be cut up without in the least endangering the safety of the man employed to work the shears, since they are comparatively at rest during the whole operation, and the attendant has them so completely under control by means of a stop cock that they can be stopped instantaneously when required at any part of the stroke.

The two pumps, AA, are each ¾ in. in diameter, having a 3 ins. stroke; and the press ram, B, 9¼ ins. diameter with a travel of 6 ins., this being a convenient size for shearing such scrap as has been referred to. The machine stands 2 feet 6 ins. above the ground, and occupies a space of 11 feet 6 ins. by 2 feet 6 ins., or about 30 square feet, this space including standing room for the pumps. The cylinder, C, and shears, D, are fixed horizontally, so that no foundation is required; and if thought desirable the machine can be placed on wheels, so as to be readily moved from one part of the works to another. The press being provided with a safety valve, absolute safety against overstrain is secured. In consequence of the shears being so little raised above the ground a tyre can be rolled alongside the machine, and any part of its circumference dropped between the cutters, D; the stop cock, E, from the pumps is then opened by the boy in charge, and the tyre can be cut up at the rate of six pieces per minute.

The pumps, AA, are fixed on the top of the tank, F, and are worked by eccentrics, which together with the flywheel, G, and fast and loose pulleys, H, communicating by means of a strap with any prime mover, are fixed on to the horizontal shaft, I, running in bearings on the upright frames bolted down to flanges cast on the sides of the tank. The pumps are fitted with a safety valve and clack valve, and are connected with the press by pipes, K, through which the water is forced into the cylinder, C, thus forcing the ram, B, having a cutter or shear, D, firmly secured to its prolonged end, against the bar of iron inserted between the moving and fixed shears, and cutting it through. The part, L, of the ram passing between the plates and the jaws, M, is square, and kept in its proper position by guide blocks let into recesses cast in the jaw pieces. The stationary shear, D, is bolted to an upright block, N, forming part of the same casting as the cylinder, jaws, and bed. A crossbar, O, secured to the ram by screws has a chain connected to each of its ends, passing over two pulleys and carrying a weight, P, for the purpose of bringing the moveable cutter and ram back, when communication between the pumps and cylinder is cut off by means of the stop cock. For working the machine, all that is required is to start the pumps by throwing the strap on to the fast pulley; and the motion of the cutter can be regulated or stopped instantaneously by unscrewing the stop cock, E.

Some experiments have been made by the writer with this press at Mr. Eastwood's works, for the purpose of ascertaining the relative resistance of wrought iron to shearing

* From a paper read at the Institution of Mechanical Engineers.

in different thicknesses and proportions of width to thickness; this plan of press affording the opportunity of measuring the force actually employed at the moment of cutting by the pressure upon the hydraulic ram. The pressure was measured, as the most eligible method available, by hanging weights at the end of a long hand lever for working the force pump, the distance from the fulcrum to the pump being 3¼ ins., and from weight to fulcrum 78 ins., or 24 to 1; the area of the ram being 111¾ times that of the pumps, the total ratio of the actual pressure on the cutters to the load employed was 2,682 times. All the experiments were made with hammered scrap iron of uniform quality; and the following general results were obtained.

Punching a 1 in. hole through ½ in. and 1 in. bars required 36 and 69 tons respectively, or a mean of 22·5 tons per square inch of sectional area cut, as measured by the circumference of the hole multiplied by the thickness. Punching a hole 2 ins. diameter through ½ in., 1 in., and 1½ in. bars successively, required 65,132, and 186 tons respectively; giving a mean of 19·4 tons per square inch of the sectional area cut, or 14 per cent. less in punching the 2 in. holes than in the 1 in. holes.

Shearing flat bars was tried with sections 3 ins. by ½ in. and 3 ins. by 1 in.; and the results gave a mean of 22·7 and 21·5 tons per square inch of sectional area cut, the difference being inconsiderable between the two directions of shearing, flatways or edgeways.

In comparing the shearing of these sections, 3 ins. by ½ in. and 3 ins. by 1 in., with the punching of a 1 in. hole through ½ in. and 1 in. bars, the result is nearly the same in both cases with the ½ in. thickness, and with the 1 in. thickness about 5 per cent. less in shearing than in punching, the area of section cut through being about the same in the cases of shearing as in those of punching,

In the experiments, cutters with parallel edges were used; but when the ordinary cutters with edges inclined to one another at an angle of 1 in 8 were employed, the force required in shearing was diminished, and considerably so in the case of the thinner sections when sheared flatways; and as bars are usually sheared flatways, a decided advantage is shown in favour of inclined over parallel cutters. The force in tons per square inch of section cut with the bars:

		Flatways tons.		Edgeways tons.		
3 × 1¼ inch	was	18·2	and	20·1	or	10 per cent. less flatways.
4½ × 1¾		14·3		17·9		20
3 × 1		15·7		21·1		26
5¼ × 1¾		16·7		22·6		26
6 × 1½		15·0		18·4		18

A trial was also made of the force required to shear some hard railway tyres 1¾ in. thick, and the result was 185 tons total edgeways, and 99 tons flatways.

A 3 in. square bar of rolled iron was also tried, and the force required was 155 tons total, against a total of 165 tons required for a hammered bar of the same section.

THE MODE OF MAKING THE NATIONAL SURVEY.

(Continued from page 76.)

8.—Construction of the Maps on Copper and tracing for Engraving.

Six-inch Map.—The six-inch map is engraved in sheets, 3 feet by 2 feet, the sheets of each county being made to fit together by the marginal lines so as to form, if required, a single plan.

For this purpose the co-ordinates of all the trigonometrical points, and of the corners of the sheets of the map, are computed with reference to the meridian of a central trigonometrical point in each county. The sheet lines are then drawn, and the trigonometrical points laid down on the copperplates by their co-ordinates, which is done with a machine, the principal parts of which are two scales at right angles to each other, and a tracing point which traverses in directions parallel to the scales.

The photographed plans being traced on tracing paper with lamp black, the tracings are fitted down by the trigonometrical points and sheet lines to the copperplates, which are previously covered with a thin coating of wax; they are then rubbed with a burnisher, by which means the lampblack is transferred to the wax, and when the tracing is peeled off there remains on the wax an outline drawing sufficient for the guidance of the engraver, who cuts the work into the copper through the wax ground.

Each six-inch engraving contains 24 square miles, and embraces the same district of country which is contained in 16 plans on the $\frac{1}{2500}$ scale, the marginal lines of which are equivalent to 1½ mile and one mile respectively.

The latitudes and longitudes have been

of late engraved on the marginal lines of the six-inch map. The meridional point in each county being always a point in the grand triangulation of the kingdom, its latitude and longitude are known with the greatest accuracy, and from these are easily computed the latitudes and longitudes of the sheet corners of the map.

One-inch Map.—The one-inch maps of Scotland and Ireland are being laid down on Flamsteed's projection modified, and the sheets of each kingdom will therefore join together to form one map; this is not the case with the one-inch map of England, which has not been laid down on any projection but by the method of parallels and perpendiculars to different meridional lines in different parts.

The plans are reduced for the engraver by the pentagraph or by photography from the engraved impressions of the six-inch map, and are then traced, and the tracings fitted down to the copperplates by means of points previously scored on the copper in the same manner as the tracings of the six-inch map, the distortion caused by the projection being quite insensible in a small area. The *hill features* are first sketched on 6-inch engravings, and are subsequently drawn on the reduced scale by a skilful draftsman for the engravers to copy.*

The contours on the 6-inch map are of great assistance to the hill draftsmen in regulating his scale of shades and fixing the proper relative importance of the different features, as well as for giving the exact form of the map of the hill.

Plans of Towns.—These are engraved on copper, and the scale on which they are engraved being five times that of the plans on the $\frac{1}{2500}$ scale, it is arranged that twenty-five sheets shall be included in one $\frac{1}{2500}$ sheet.

9. Engraving.

The engraving consists of two processes, viz., direct cutting with the "graver" or "the dry point," and of etching.

The instruments called gravers are of various shapes and sizes, according to the kind of lines required to be produced. Square gravers are used to cut broad lines, and lozenge-shaped gravers for the finer ones; they are pushed forward in the direction required to form the lines.

The "dry points" and etching points resemble large sewing needles fixed in handles about five or six inches long. The graver *cuts* the copper out, forming a clean line; the "dry point," used for the more delicate lines, raises a "burr," which has to be removed by an instrument called a "scraper," otherwise the work would print very thick and unequal.

Etching consists in covering the surface of the copper-plate with a substance called "etching ground," composed of asphaltum, Burgundy pitch, and virgin wax. The subject is traced on the ground, and with the "etching point" marked *through* to remove the ground wherever it passes, and expose the surface of the copper to the action of aquafortis, technically called "biting-in." This process is continued until the fainter tints are sufficiently deep; the acid is then poured off, the plate washed with pure water, and dried.

The parts that are bitten-in enough are now painted over with "stopping-out" varnish; when dry the acid is again poured on the plate, and the process of "stopping-out" and biting-in must be repeated in this way until the darkest tints are sufficiently corroded.

The work has to be completed with the "dry point," to give the more delicate tints and finish. The hills on the 1-inch map of England are thus etched, and afterwards completed with the dry point.

A considerable saving in the cost of engraving the Ordnance maps is effected by using steel punches to cut the woods, figures, rocks, &c., on the copper-plates.

The work is thus done much more quickly than by hand, and boys are employed at it in the place of skilled engravers.

A portion of the writing also on the copper-plates is engraved by machine (Becker's patent), and the parks and sands are ruled by machine with a steel dotting-wheel, the pressure of the wheel and the interval between the lines of dots being regulated according to the tint required to be produced.

10. Copperplate Printing.

The ink is dabbed on the copperplate with a dabber made of old blanket, and is first wiped off with a cloth dipped in an alkali solution, and then finally cleaned off with a cloth wetted with water only.

In such large surfaces as those of the copperplates of the 6-inch map this method is much easier to the printer than the usual mode of wiping with the hand.

The paper for printing is wetted and brushed over to make its surface smooth for the better reception of the ink, and being laid on the copperplate is passed through the press, the upper roller of which is wrapped round with three turns of blanket and one turn of a cloth called "fronting," which is placed next to the paper. After printing, the impressions are first dried between mill-boards and are

* It is contemplated to reduce the hill sketches for the engraver by photography.

then placed between glazed-boards and pressed in an hydraulic press, after which they are ready for issue.

The ink used in copperplate printing consists of Frankfort black with a mixture of Prussian blue; it is ground with burnt oil in a small mill constructed at the Ordnance Map office for the purpose.

11. Electrotype.

The process of electrotype is applied at the Ordnance Survey office to the purpose of obtaining duplicates of the copperplates of the Ordnance maps, and has been found to be eminently useful, not only as a means of always preserving unworn copies of the plates, but also as enabling copies of them to be taken in their different stages of progress, so that different classes of information can be engraved upon a map the same in all other respects; as, for instance, we may have one copy of a map with contours, boundaries, &c., another with the hill features engraved, a third with geological lines, &c.

It has also been usefully employed in joining two or more engraved plates together so as to form a single copperplate for printing from. In order to do this, electrotype matrices of the plates are first taken, and having been cut to the edges to be joined, are fitted together as closely as possible, after which a thin piece of metal is laid along the line of junction at the back of the plates, and is riveted and soldered to each of them; the ends of the rivets being cut off flush with the upper surface, which is scraped and burnished to an even plane along the junction. The joined matrices are then placed in the decomposing trough, and a copper *duplicate* is obtained, on which the portion of the engraving which has been destroyed in scraping the edges (to the extent of about one quarter of an inch along the line of union) is made good by the engraver.

In this way county maps of several counties in Scotland have been formed (to serve as indexes to the 6-inch maps of those counties) out of the copperplates of the 1-inch map; in one instance no less than seven plates have thus been joined together.

Another great advantage is the facility which the process affords for altering engravings, it being much easier to scrape off obsolete details, &c., from the electrotype cast or "matrix" of an engraved plate in which they are in relief, than to *cut* them out from the original copperplate, this application has been especially valuable in the insertion of the railways on the one-inch map of England, which could hardly have been effected by the ordinary mode without destroying the plates.

The galvanic battery employed is that invented by Mr. Smee, in which the metals are zinc amalgamated with mercury and copper silvered and platinized, the exciting liquid being dilute sulphuric acid.

The zinc plate, 2 feet by 2 feet 4 inches, and weighing 85 lbs., is suspended between two platinized silvered plates of the same size as itself in a bath of dilute sulphuric acid (about twenty gallons of water to one gallon of acid); to each of the silvered plates is attached a bundle of six copper wires ($\frac{1}{10}$-inch in diameter), which are united together by means of a screw-plate, from which there proceeds a bundle of twelve copper wires, the extremities of which are soldered to a sheet of crude copper of the same dimensions as the plate to be copied.

From the zinc plate also proceeds a bundle of twelve copper wires, which are attached to the engraved plate, which has been previously washed over with cyanide of silver, and then with a solution of iodine, which is afterwards evaporated in the sun, by which means all chance of adhesion of the new to the old copper is obviated.

A composition of wax and tallow is also laid round the edges of the plate, to prevent the deposit of electrotype copper around them.

The engraved and the plain copper sheets are then laid horizontally one above the other, with the space of about an inch between them, in a wooden trough lined with lead or gutta-percha, and containing a saturated solution of sulphate of copper and sulphuric acid. As soon as this is done the galvanic action begins, copper is deposited on the engraved copper-plate, and the zinc plate in the battery tank commences to be dissolved, the sheet of crude copper in the trough also dissolving and supplying the waste in the sulphate solution caused by the deposit of copper on the engraved plate; during the process a rocking motion is given to the troughs by means of a simple machinery of which the motive-power is a descending weight, which is wound up about every seven hours, the total descent being about forty feet. As soon as a sufficient time has elapsed the plate is taken out of the trough, and the sheet of copper which has been deposited is removed from the engraved plate, of which it will be found to be an exact cast, the sunk lines on the engraving being represented by the lines in relief on the electrotype "matrix." The same process being repeated, with the substitution of the newly-made "matrix" for the engraved plate, an electrotype "duplicate," an exact facsimile of the original engraving in every respect, is obtained.

The platinised plates are dipped every day into a solution of perchloride of iron to remove impurities, and the zinc plates are scrubbed at the same time.

When the battery is in good working order, and the engraved plate is laid *under* the sheet of rough copper, about ½ lb. of copper to the square foot is deposited per diem. With the engraved plate *uppermost*, only half that quantity is deposited, but the copper is of better quality and more free from impurities.

Experiments have been tried, to ascertain the increase of the amount of deposit to be obtained by heating the metallic solution; this was found to be very considerable, about 1 lb. of copper per square foot having been obtained in the twenty-four hours; the process, however, is a more expensive one, and the fumes arising from the troughs most pernicious, so that it is not desirable to use hot solutions, except in an emergency when a plate is required to be copied in the least possible time.

THE ATLANTIC TELEGRAPH.

The able correspondent of the *Times*, last week, gave a full and practical *exposé* of not only the mishaps which have befallen the cable, but the cause of these effects — the nature of the cable itself —which, however suitable for shallow waters, is entirely inapplicable, from its construction and specific gravity, to the extreme depths and span of the Atlantic. He states,—"That, for the Atlantic, nothing but the comparative infancy of the science of cable laying, will ever excuse the attempt having been made with such a description of rope." And again,—"Wire-covered ropes for such deep seas as the Atlantic are not only useless, but literally almost render such an undertaking impossible." Also, that ropes of light specific gravity only are suitable, which would enable us to dispense with "all the paying-out machines, buoys, slip ropes, hauling-in apparatus, and all the worthless and expensive lumber which has been foisted into what, under a different arrangement, should be one of the simplest mechanical operations." We are glad to revert to these remarks of an eye-witness, being, from the test of experience, corroborative of the principles we have ourselves so frequently propounded in reference to the inventions of Mr. Allan, in Submarine Telegraphy.

We may here recapitulate the principles of construction, or rather the philosophy of the submarine cable, the conditions of which are so well maintained in the cables patented by him,—namely, that they combine with the necessary conductibility for the distance, the greatest amount of relative strength possible to be attained, and that, too, in the form of an inextensible core, so as to counteract tension and consequent injury to the insulating medium; and that the specific gravity of a submarine cable should, within certain limits, be inversely as the depths of the sea on the intended route; that is to say, the shoaler the water, the heavier should the cable be, and *vice versâ*. There should, therefore, be three several descriptions of cable; viz., that which within tideways will be subjected to the effects of tides and waves, and the chances of abrasion from stones and other disturbances, from anchors, &c., whose specific gravity should be about 4·5, or more; a second part which might be affected by slight agitation of the bottom, of a specific gravity of 3; and a third part for the deep sea, and which should not have a specific gravity greater than 1·5, although less—say 1·3 (little more than that of common tarred rope)—would be quite enough; the latter specific gravity taking considerably over three hours to sink to a depth of 2,000 fathoms—a rate fast enough for any purpose of submergence, and also insuring a straight and uniform issue of the cable from the ship. A rope of this specific gravity and weight could be handled with great facility, and paid out with great rapidity, dispensing entirely with friction-breaks and paying out gear, which are necessitated only by heavy ropes, the primary cause of all the mischief in such undertakings.

It will thus be obvious that by such an arrangement of parts, as to strength, conductibility, weight, and specific gravity, in accordance with the first principles of natural science, a submarine telegraph may be established in any depths and to any distance with comparative certainty; the process being thus rendered at once simple, and to all intents and purposes analagous to veering out a log line.

With these objects in view, the peculiar feature of Mr. Allan's cables is that of his putting the metallic strength in the centre of the insulating medium, thus forming an inextensible core in place of a wire casing as heretofore. This, in the specimens shown at the Institution of Civil Engineers during the discussion on Mr. Longridge's paper on the submergence of telegraphic cables, was effected by a strand of iron wires, or of iron and copper mixed, this latter being lighter and more effective in many ways as combining the conductibility of the copper with the strength of the iron. It is then coated with gutta percha in the usual way, and the whole enveloped in strands of hemp or coir rope, with or without an outer serving of tarred yarn.

Contenting ourselves with this brief

exposition of the principles maintained by Mr. Allen throughout, the correctness of which has been so fully exemplified by recent occurrences, not the least of which has been the late trials in the Atlantic, we trust now that the truth of science in regard to submarine ropes may be said to be fairly ascertained, that no fastidious or sinister influences will prevent the public from the benefit of his discoveries.

SUBMARINE CABLES AND THEIR DEFECTS.

By an Electrician.

There are few subjects which are at present exciting more interest and discussion in the scientific world than that which relates to the construction and laying of submarine cables, and the phenomena involved in working through them. The telegraph engineer has here to contend with a special class of conditions, not met with in the working of atmospheric lines. The action of a wire covered with an insulating sheath and deposited in water, is altogether different from that of a wire insulated freely in the atmosphere, with regard to the transmitted dynamic currents, and the phenomena developed by the former are of an exceedingly complex and abstruse character, requiring deep scientific research for their comprehension. It has now become a great desideratum to obtain a cable, which, while it shall combine all the mechanical advantages of flexibility, strength, lightness, and compactness, should also possess the following essential electrical qualities; viz., the greatest degree of conductivity in the smallest space, the most perfect insulation, and the least possible capacity to receive statical induced charge.

That many cables possess some of these qualities is undoubtedly true, but no one cable in present use combines the whole. If these qualities be admitted as essential requirements, and they are by no means of an arbitrary character, it will be no difficult matter to discover the particular points in which the various cables in present use are defective; for example, a cable covered with stout iron wires, or, indeed, with iron wires at all, may possess the element of strength, but not of lightness. A cable whose internal conductor is of iron instead of copper, may possess the elements of compactness and strength, but it not only does not possess the greatest degree of conductivity in the smallest sphere, but from the necessarily increased dimensions of its inefficient conductor, a very much larger internal surface of gutta-percha is exposed to the action of the induced charge—the bane of long submarine conductors; hence, it is about the most objectionable and unscientific form of cable that could be well devised. The Atlantic Cable, perhaps, comes nearer to the mark than any other, but it possesses three radical defects. 1st, Its wire coating makes it too heavy for its relative strength. 2nd, Its conductor is so small and its resistance so great in proportion to its length, that it requires voltaic arrangements of infinitely greater intensity than any hitherto employed to work a current through it; and, 3rd, the amount of statical induction consequent on this high intensity, is such as to be equivalent in action to a prolonged residual current producing effects of the same character as the primary current; and which electrically speaking, require a long time for their subsidence: hence the tardiness with which signals are transmitted. These defects, however, are by no means irremediable, and a proper attention to the already well-defined laws of electrical science will remove these difficulties; indeed, a cable has been already patented, although not yet before the public, which is stated to be free from all the foregoing objections, and to possess the qualities enumerated at the outset in an eminent degree. One of its great advantages would be, that it would not require the use of any machinery to lay it; or rather, as in the case of the Atlantic Cable, to strain and break it, and thereby deprive it of an opportunity of fair play. It is needless to remark, that such a cable would necessarily commend itself for future adoption. It is a false economy that endeavours to reduce the size of the internal conductor with a view of saving expense, for this is more than counterbalanced by the increased expense of working and the commercial loss from the delay in the transmission of signals. It may be argued, that increasing the size of the conductor increases the charging surface of gutta-percha; but as this only increases with the circumference, whilst the resistance is inversely as the transverse sectional area, and as the intensity of the current, which is the cause of the charge, is in proportion to the resistance, so it follows, that the absolute amount of charge must lessen in proportion to the increased size of the conductor.

There is a still greater advantage than this to be derived from more efficient conductivity. In proportion as resistance is increased, so the current assumes, by its increased intensity, the character of statical electricity, and the relays, etc., must be constructed so as to be sensitive to electricity of this character; and in proportion as they are so adjusted, so are they liable to be acted upon by the induced static discharge. Now, on the contrary, as the conductivity of the wire is increased, so

the dynamic character of the current is proportionally preserved; and just in proportion as telegraphic instruments are sensitive to dynamic currents of low intensity, so are they free from the disturbing influences of static discharges. It appears difficult, then, to understand how, on the face of these conditions, the conducting character of submarine cables is constantly kept so low; nay, the tendency still appears rather to decrease than increase their conducting capacities, and hence the present inferiority of submarine to atmospheric conductors in their working facilities.

THE QUARTERLY REVIEW *v.* HENRY CORT:

A DEFENCE, BY THE SON OF HENRY CORT.

GENTLEMEN,—The *Times*, your own, and fifty other influential journals, have advocated the unexampled claims of the late Henry Cort, for rendering the British nation independent of foreign powers for that most indispensable article, bar iron.

In the *Quarterly Review* of this month, the writer of an article on "Iron Bridges" states that, "Dr. John Roebuck, grandfather to the present member for Sheffield, may be said to have *originated* the *modern* iron manufacture of Britain. * * * Besides being the first to manufacture cast iron by means of pit coal on a large scale, Dr. Roebuck was the inventor, in 1762, of the process of converting the produce into malleable iron,—a discovery usually attributed to Henry Cort, whose patent was taken out twenty years later. Dr. Roebuck's specification *leaves no room for doubt*: the cast iron was melted on a hearth with a blast, and then worked until 'reduced to nature:' in that state it was exposed to 'the action of a hollow pit coal fire, heated by the blast of bellows until reduced to a loop,' which was then 'drawn out under a forge hammer into bar iron.' Successive improvements were made by the Cranages, in 1766, who invented the reverberating, or air furnace; by Onions, in 1783, who patented the puddling process; and finally by Cort, in 1783-4, who, besides *embodying their processes in his patents*, introduced the grooved roller, an addition of great importance."

Had the writer only glanced at the specifications of Henry Cort he would have discovered, that instead of "embodying the processes" of Dr. Roebuck, the Cranages, (as it should be, not Carnages as the "Quarterly Review" has it) or Onions, in his patents, as he states, each of these processes were proved to be good for nothing for want of *not embodying* the processes of Henry Cort,—such as balling, piling, rolling, &c., without which no valid patents could have been granted to the latter. Cort's specifications, in 1783-4, distinctly state that,—"the whole of his discovery for the manufacture of iron and steel into bars, plates, and rods, and by *puddling, balling*, and *rolling*, was produced by a more effectual application of fire and machinery as described, than was before known or used by others, and was entirely new and contrary to all received opinions amongst persons conversant in the manufacture of iron; and that the whole of the methods could be completed without the necessity of using finery, charcoal, coke, chaffery, or hollow fire, and without requiring any blast of bellows, or cylinders, or the use of fluxes in any part of the process."

In fact, every pound of malleable rolled iron, consumed in Great Britain and foreign countries, during the last seventy years, has been manufactured by Henry Cort's inventions, and no others before or since patented.

The article on Iron Bridges is prefaced with seven different authorities,—consulted, I presume, by the writer previous to publication; including, among these, "A Comprehensive History of the Iron-trade, by Harry Scrivenor," and "The Encyclopædia Britannica, for 1857," which renders the mistake which the writer has fallen into with reference to the claims of Henry Cort the more inexcusable. Scrivenor's History of the Iron-trade occupies 318 pages; more than 200 of which are devoted to Great Britain alone, and nearly 100 pages are entirely confined to the inventions of Henry Cort, and the practical effects of them from 1783 to 1854.

But, instead of recording any results, good, bad, or indifferent, from the inventions of Dr. John Roebuck, the Cranages, or Onions, *not the slightest allusion is made to the patent of either one or the other*, the author well knowing, probably, that the whole of them were failures.

According to Scrivenor (page 38) "Dud Dudley, the son of Lord Dudley, in Staffordshire, in the reign of James the First, was the first to obtain a patent for making iron with pit coal,"—which was *raw* coal, the Dudley family having estates in Staffordshire and Worcestershire, full of iron ore and suitable *inflammable* coal; not like that of the Carron-works, where Dr. Roebuck first experimented (which the writer might have seen in Scrivenor, page 84) which was so "*uninflammable*" that charcoal was obliged to be substituted. At this time the make of the blast-furnace did not exceed 12 tons weekly; whereas now, with pit coal, for Cort's malleable rolled iron, it averages considerably more than 100 tons weekly.

Had the writer looked to the bottom of page 65, he would have seen that Scrive-

nor states, that Dr. Plott, in his "History of Staffordshire" says, that the last effort made in that county (16th century) for making iron with *pit coal*, was by a Mr. Blewstone, a German, who built his furnace at Wednesbury, so ingeniously contrived that only the *flame* of the coal should come to the ore; with several other conveniences. But experience, that great baffler of speculation, showed that this could not be; the sulphureous vitriolic streams that issue from the pyrites, which frequently, if not always accompany pit coal, ascending with the flame, and poisoning the ore sufficiently to make the iron much worse than that made with charcoal.

It remained for Henry Cort,—and for his genius alone,—to overcome these difficulties, by the balling and heating process, patented by him in 1783; without which and the rollers, puddling with the flame alone could have been of no value for wrought iron. The next experiment was made in the early part of the last century, at the Coalbrook Dale Iron-works, in Shropshire, by Mr. Abraham Darby; and a Mr. Ford also, in the same Dale, (Coalbrook) made iron brittle and tough with pit coal, as the writer might have seen at page 56.

The Cranages, (who, he says, invented and patented the reverberatory or air furnace, heated by the flame of pit coal, in 1766,) were workmen employed under the same Coalbrook Dale Company; but these men must have been "baffled in their speculation," in the same way as Mr. Blewstone was, for want of Cort's balling and piling process, as the Company have never ceased working under Henry Cort's patents for the last sixty years, without which they never could have made a single pound of malleable rolled iron.

The Carron Iron Company, too, which was projected by Dr. John Roebuck, was the first, in 1786, to appreciate so highly the inventions of Henry Cort for puddling, balling, and rolling iron, that they invited him to establish his works on their mineral possessions; and in 1792, only eight years after Cort's patents, Sir John Sinclair reports in his statistical account of Scotland, they had five blast furnaces, sixteen air-furnaces, three cupola furnaces, four boring-mills, besides a forge for making malleable iron, a plating forge, and one for stamping iron, &c.

In 1788 the total make of pig iron in Scotland was 7,000 tons; now it exceeds one million tons with pit coal annually. The introduction of the hot blast, by Mr. Neilson of Glasgow, in 1828, and the discovery by Mr. Mushet of the blackband ironstone, greatly contributed to this result for Scotland.

Besides, if the whole of the inventions for 250 years previous to 1782 had not been total failures, would the iron trade of Great Britain have been the *least* instead of the greatest in the world, making only 18,000 tons of pig iron with charcoal fuel, and exporting scarcely a single ton of bar iron? Whereas, by the inventions of Henry Cort, the total make of pig iron with pit coal now exceeds 3,600,000 tons annually, or as much as all other nations making iron united together are able to produce. Besides, this country is now exporting more than 1,200,000 tons of iron of all sorts annually, including 800,000 tons of Cort's rolled iron, and making more than a million tons of rolled iron for home consumption.

The writer might have stated that the steam engine,—the creation of which was so greatly assisted by Dr. Roebuck,—could not have been so extensively used in this and all other nations for conveyance by land and sea, for agriculture, mining, and other purposes, without the inventions of Henry Cort. 1,200 millions of passengers could not have travelled over 80 millions of miles of iron railway without combining skill, capital, and Cort's inventions; 40 millions of money could not have been saved every year, according to Mr. Robert Stephenson, by railway conveyance alone; 25,000 iron bridges could not have been constructed, besides iron tubular and iron wire bridges, iron cables, and iron wire for telegraphs, iron ships, iron palaces, iron houses, iron cotton mills, iron paper mills, and iron machinery for printing, nor any of the other thousand applications of wrought iron, without the inventions of Henry Cort.

All this the writer in the *Quarterly Review* might have known and admitted, instead of leaving others to infer that Henry Cort embodied in his patent the inventions of others instead of his own. But the writer not only overlooked all the inventors of iron making with pit coal *previous* to Dr. Roebuck, but the opinion of Scrivenor as to the real merits of Henry Cort's inventions, who says, p. 121: "To give some idea of the importance of Mr. Cort's invention of rollers previous to their introduction, the smallest size drawn under the hammer was three quarters square; all below that size were cut in the splitting mill, and it required the hammer to be kept constantly at work to draw 20 cwt. of average sizes in 12 hours; which with the rollers they can manufacture in the same time with one pair of rollers about 15 tons, which, in a work in full operation, are kept constantly employed day and night during six days in the week. Of the small sizes they roll about 5 tons in the 12 hours."

The writer, it is to be presumed, did not examine the article in the "Encyclopædia

Britannica," in 1857, when he connected it with iron bridges or iron manufacture, or he must have seen, in vol. 12, p. 574, the article on iron, by Mr. William Fairbairn, F.R.S., universally admitted to be one of the highest authorities upon all that relates to iron manufacture. He states that "Henry Cort's inventions have conferred an amount of wealth upon the country, equivalent to 600 millions sterling, and have given maintenance and employment to 600,000 of the working population for the last three or four generations," &c.

No wonder, then, at the writer's mistake, or that the *Times* on the 29th July, 1856, should have declared Henry Cort to be the "Father of the Iron-trade of the British Nation, and the Tubal Cain of our Country;" which all the most influential journals throughout the kingdom have since acknowledged. RICHARD CORT.

Hemingford-terrace,
Caledonian-road.

A NEW METHOD OF DRAINING LONDON.

BY THE INVENTOR AND PATENTEE.

WITH all due deference to the engineering and scientific skill that has been brought into action on this great question, I feel confident that all have been at fault in not dealing with the matter naturally. Then let us call nature to our aid; and let us first see what she has done for us, and then let us follow her laws. Geology is the science that must be put in requisition to aid us. The Creator has laid at our feet the materials through the medium of which the greatest sanitary work that was ever carried out by man can be accomplished.

Engineers and scientific men either do not study this science, or they have overlooked it in devising their plans. It behoves us now, before it be too late, to avail ourselves of the facilities that are offered to us in the great London Basin, covering an area of some 12,000,000 acres, 4,000,000 of which extend under the sea, and 8,000,000 under our feet, and the strata of which available for our purpose penetrate to a depth of near 2,000 feet. Here is a grand field for operations! Why should we throw our money away for constructing main intercepting sewers to carry our sewage out to sea, when the Creator has provided us with one better suited for the purpose than any that man can devise? Here is a channel that will carry off direct into the sea the sewage of this metropolis were it ten times the size; whereas, if one intercepting sewer be constructed, we shall find in a few years that it will have to be enlarged to suit the increased population.

The great London basin, as is well-known, consists of different strata, all inclining towards and under the ocean. Some of these strata are porous, and others are not so; hence the water they contain is kept separate. The chalk and sand formation, averaging 600 or 700 feet thick, is so formed by nature that it will absorb any amount of liquid entering it, and discharge it into the sea. It is proposed to make use of these or similar strata by sinking shafts into them, to which and through which the liquid portion of the sewage shall flow. To effect this, I first of all take, say, two of the present main sewers, and connect them by means of iron pipes; these again are connected with a deodorizing and precipitating pan, in which it is proposed to apply a principle that will not only retain but increase the fertilizing qualities of the deposit here obtained,—and which is reduced to a dry powder, similar and very little inferior to guano; from this such a revenue should be derived as not only to defray the annual expenses of the sewage operations, but to leave a handsome surplus. The advantages of this are so great and so obvious, that comment is not required. From the deodorizing pit the liquid portion of the sewage will pass off through a filtering-bed into a tank, which will consequently contain only sewage water divested of all its solid impure qualities; a pipe will conduct this to the main shaft, in which it is proposed to construct a turbine water wheel, which acted upon by the falling liquid on its way to its destination —the sea—through the strata into which the shaft may be sunk, sets in motion a pump or pumps for obtaining pure spring water from a higher stratum, for any purpose to which it may be requisite to apply it. When not otherwise required, it can be allowed to enter the Thames.

The advantages of this system, in a sanitary point of view, will be immense. Fountains of pure water will be within the reach of all to the extent of millions of gallons daily; as by taking the surface water twice as much can be obtained, if necessary, as we use of sewage water for power,—as will be understood by scientific men—and this without cost. Having thus treated of the application of this principle to two or more sewers, it is only necessary to proceed with the others seriatim; and as we thus proceed, the sewers diverted in succession, can be built up at their mouths, and thus a gradual and rapid improvement will be effected in the state of the river, so that by the ensuing summer little or no inconvenience will be experienced from the state of the Thames, and

we shall command the immense advantage of testing the value and efficiency of the plan step by step, and can pause for the public to judge of its merits. I ask, whether this alone is not an advantage that places it far above any plan yet proposed, and sufficient to recommend its adoption, at least as an experiment?

It will be seen that no steam-power whatever will be required, no reservoirs measured by acres, and no main intercepting sewers; thus not only will an enormous present outlay be saved, but an actual surplus revenue to apply to further useful sanitary improvements will be at our command.

This plan can be carried out for less than one million of money, and the whole be completed in less than two years, when not the smallest portion of sewage will enter our noble river, which will again become the source of health and recreation to the teeming population on its banks. Again, this plan is adapted also for draining lands, low levels, &c., and will entirely remove the evil of back sewage, which is now returned even into the very basements of our dwellings by a high tide. No flushing of sewers will be required, as no accumulation can take place in them. Indeed, the advantages are so numerous and so obvious, that it is almost needless to speak of them.

In conclusion, it is asked, whether it will be better to burden the metropolis for years to come with a heavy rate, for the purpose of carrying out a plan, doubtful in itself, most expensive, and from which, even if successful, we shall derive no advantage whatever till the whole be completed at the end, probably, of five or six years, in preference to adopting the plan here laid down, with all the advantages set forth, and with the certainty that an immediate improvement will be effected, and at the same time its efficacy tested?

The inventor thus submits his plan to the public and the authorities, being quite prepared to overcome all prejudice and to meet all opposition, and ready also to submit his plan to all the engineering and scientific skill that can be brought to bear on the subject, to examine and scrutinise it, being confident of an ultimate triumph.

RICHARD JEX CRICKMER.

Bermondsey, July 27, 1858.

THE DUTY ON PAPER.—It is a singular fact—and one which proves the unselfishness of the press of this country—that the maintenance of the tax upon paper, which is fraught with injury to writers, printers, and publishers, as well as to the cause of education, has been permitted to survive many less obnoxious imposts. The press has now, however, resolved to submit to its imposition no longer; and it would be strange indeed if the present or any other Government should hope to continue a tax which every intelligent Journal in the kingdom is prepared to resist.

THE SEWAGE OF LONDON.

GENTLEMEN,—The present arrangement of sewers and disposal of sewage matter seems to me to be the least likely of any that could possibly be devised for fulfilling those conditions necessary to the sanitary well-being of the people which it professes to have exclusively in view.

What are the facts? The refuse of three millions of people is conducted into enormous sewers, and exposed at a temperature several degrees higher than the external atmosphere to the action of a large volume of air. No plan could better facilitate the rapid decomposition of organic matter and the consequent evolution of offensive odours; and, in order to judge how successfully this is accomplished, holes are constructed at very short intervals along the centre and sides of the streets, so that all may enjoy the full benefit of the stinks so successfully generated. The solid matter remaining in the sewers is then allowed to discharge itself into the river, there to undergo, at its leisure, a similar transformation on a more extensive scale.

It is, of course, admitted, that sewers of the existing dimensions are required in order to carry off the storm water, and it is owing to this being permitted to mix with the sewage proper that monster intercepting sewers are required to divert its outfall into the river.

It is, surely, possible to overcome this supposed difficulty with comparatively little expense and trouble. Use the existing sewers for carrying off the storm and waste waters, and let *them* run into the river; but construct an inner sewer or pipe sufficiently large to run no risk of choking up, and let this receive the matter coming from closets, &c., whence proceed the true and only source of the evil, viz., the organic matter.

Let us see what would be the advantage of a scheme of this kind. In the first place, no stench could rise into the streets; nor could decomposition go on so rapidly, as the fecal matter would pass to its outfall at a more rapid rate, and in contact with a smaller proportion of air.

The sewage would then be obtained in the most concentrated form possible, and in a state in which any feasible plan for converting it into a profitable manure would have every prospect of being attended with success.

A very great misapprehension seems to exist as to the possibility of recovering the fertilising principles from sewage.

It is asserted, that during its transit through the sewers the solid matter loses nearly all its nitrogen and phosphoric acid, which are then found dissolved in the

water, and that unless this liquid be applied to the land direct, no means can be devised for obtaining a profitable return; that what is in solution cannot be recovered in a solid form, and that the solid sewage which remains is not worth carriage. I wish most strongly to urge, that this is an erroneous opinion.

In the plan which I propose, and which has already appeared in your columns (No. 1822, p. 30), I state that burnt clay has the property of depriving sewage of all its nitrogenous constituents, and forms a manure of the greatest practical efficiency. When I say sewage, I, of course, mean both liquid and solid sewage. The way in which the burnt clay acts is, I believe, by absorbing the ammonia; at all events it is *a fact*, the result of experiment, that, after treatment with clay, the solution I found to contain *no nitrogen.*

In confirmation of what I have above stated, permit me to quote from Professor Way's evidence, contained in the "Report on the Water Supply to the Metropolis in 1850. Appendix iii., p. 37."

Speaking of an analysis of sewage taken from Barratt's-court, Professor Way says:—"The insoluble and soluble matters are both capable of supplying nitrogen or ammonia to vegetation. The solution contains the nitrogen, in the form of ammoniacal salts; and it is a circumstance of great interest and practical importance, that all the nitrogen in the liquid state seems to be in the form of ammonia." He then proceeds to describe an experiment, illustrative of the action of soil on sewage. "A quantity of a *loamy* soil was placed in a glass cylinder to the depth of 6 in., and upon this a quantity of sewage water was thrown. The solid matter of the sewage was, of course, arrested mechanically." The clear liquid which passed through "contained no potash, *no ammonia, no nitrogen in any form,* and *no phosphoric acid.* The soil had, therefore, deprived it of its most valuable ingredients."

Burnt or dried clay has precisely the same effect; indeed, there is no doubt that it was owing to the clay contained in the "loamy soil" that Professor Way obtained these results. He also states, when referring to the value of sewage,—"thus the Barratt's-court sewer gave about 37 grains of ammonia in a gallon in the liquid state, and about 4½ grains more that would be formed from the animal matter not dissolved. Calling this 40 grains altogether, we should have in 100,000 gallons, about 570 lbs. of real ammonia. The recognised value of ammonia, as shown by the price given for Peruvian guano, is about sixpence per pound; so that the ammonia alone of this 100,000 gallons of sewer water is worth more than £14; and the potash, phosphoric acid, &c., would make a material addition to this value."

It would not be difficult to show that the quantity of ammonia and phosphates now annually wasted in London alone is almost equivalent, if indeed it does not exceed, the amount imported in the form of guano, for which we pay (according to a recent statement in Parliament) the Peruvian Government £12 per ton. In 1855, we imported from Peru 255,535 tons, which, at £12 per ton = £3,066,420. It certainly does seem a pity that we cannot pay ourselves this sum for our own guano, which ought to be as valuable as the guano of Peruvian sea-fowl.

I am, Gentlemen, yours, &c.,

HENRY WRIGHT.

11, Buckingham-street, Adelphi, W.C.,
July 23rd, 1858.

THE IRON TRADE.

FROM OUR CORRESPONDENT AT WOLVERHAMPTON.

Languor in the past month—The old Districts and the New—Increased Competition in the make, and extended application of the article made—The Day of High Prices gone—Masters attempting to free themselves from their own Bonds—The Result of the Endeavour—A Reduction probable—Prices taken—Unsettled state of Prices—A large Order, and its Distribution—Apprehensions of Present Instability—Three Failures.

THE past month has been a period of languor in the history of the iron trade that few persons expected would have characterized it. To others, however, such a state of things has not been a subject of surprise; the unsettlement which was occasioned by the late crisis being of so extensive a character, that a prolonged period they were satisfied would ensue before commerce generally, and the iron trade in particular, would recover its equilibrium.

Whilst, however, the old districts have been much in want of orders, and have been unable confidently to point to the time when there would be an improvement in this respect, the new districts have been pushing on their preparations for competing vigorously for the future trade. In so doing, they have availed themselves of those scientific and mechanical appliances to

which the old districts are at present strangers. In a short time so abundant will be the supply of iron in Great Britain, that a gratifying stimulus will be given to its more extensive application to domestic architecture, and other uses, to all of which it has hitherto been only sparsely applied.

In our opinion the day of high prices for iron is gone. The spreading competition to which we have referred will prevent a return to them. In their endeavour to maintain high prices, we know that some South Staffordshire houses in particular have, in the past month, lost some orders that they could have executed at a profit, for prices considerably below those that they demanded.

Sensible of this, some three of the leading houses in South Staffordshire strove, at the quarterly meetings that were held in the middle of the month, to lower by 10*s.* a ton, the prices which, at the preliminary meeting held at the beginning of the month, the trade agreed to maintain throughout the quarter. These were the same as had ruled in the previous quarter, and commenced at £8 for bars. Other influential houses, however, having taken some few good orders at the prices of the preliminary meeting, no declared alteration resulted, except in the case of orders from the United States, which, for the most part, will be accepted at the 10*s.* reduction.

The want of unanimity and principle which this state of things has revealed, has in the last fortnight checked orders; buyers, who watch prices narrowly, holding to the opinion that in a short time there will be a reduction of 20*s.* a ton. If they refer to next quarter, we have little doubt but they are right. At that time it will be less difficult than now to reduce wages; and if bars should come down to £7., wages must also fall. Buyers reasonably demand a reduction; for, as pigs are now bought at from £3 to £3 12*s.* 6*d.*, £8 is too high a price for bars. Whilst, however, £8 is being demanded by most first-class makers in South Staffordshire, good bars are being manufactured by other firms in that district, and by a Shropshire house of high standing, at upwards of 20*s.* below that price.

Than now, the question of prices was scarcely ever more unsettled. It is evident that soon the "Association of Masters," in so far as it relates to the fixing of prices, will become a thing of the past.

One good order has come out in the month. It was for about 90,000 tons of rails for India. So far as we have been able to learn, the order has been thus distributed:—

	Tons.
Snowden and Hopkins (Middlesbro')	10,000
Ebbw Vale Iron Company (Newport)	10,000
Weardale Iron Company (Durham)	22,000
J. Bagnall and Sons (Goldshill, South Staffordshire)	5,000
J. Beal and Co. (Parkgate) . . .	12,000
Dawes and Son (Yorkshire) . .	10,000
Wales	20,000
	89,000

If the present period of slackness should continue long, we fear that there are some houses that will yet have to yield. An uncomfortable feeling was produced by the failure, about a fortnight ago, of Messrs. N. and H. Cox, Brothers, iron and tin-plate merchants, of Liverpool, by which most of the South Staffordshire firms were affected. The liabilities are nearly £34,000. At the end of last week, the failure again of Mr. Wm. Jeffries, of the Hart's-hill Iron-works, Brierley-hill, for some £7,000 or £10,000 was announced. The iron trade is also affected by the very lamentable failure of Messrs. Astley and Williams, merchants, of Liverpool, with liabilities estimated at £68,449, and assets at £53,975, showing a deficiency of £14,473.

THE WAR DEPARTMENT.

A return to the House of Commons of the names and salaries of all persons, naval or military, now holding office in the War Department, gives, amongst a voluminous list, the following names and salaries:—Right Hon. Major-General Peel, M.P., Secretary of State, £5,000; Sir Benjamin Hawes, K.C.B., Under Secretary of State, £2,000; Viscount Hardinge, Under Secretary of State, £1,500; John R. Godley, Esq., Assistant Under Secretary of State, £1,500; Colonel Sir H. K. Storks, K.C.B., Secretary for Military Correspondence, £1,000; Henry R. Drewry, Esq., Chief Clerk, £1,200; Kenrick Bacon, Esq., Assistant Chief Clerk, £850; General Sir J. Burgoyne, Bart., G.C.B., Inspector-General of Fortifications, £1,500; Captain R. M. Laffan, R.E., Deputy Inspector-General of Fortifications, £800; Lieut.-Col. H.C.C. Owen, R.E., C.B., Deputy Inspector-General of Fortifications, £800; Major Jervois, R.E., Assistant Inspector-General of Fortifications, £500; Captain Belfield, R.E., Assistant Inspector-General of Fortifications, £500; Major-General W. Cator, C.B., Director-General of Artillery, £1,000; Colonel James, R.E., Director of the Topographical Department, £870; Andrew Smith, Esq., M.D., Director-General of Army Medical Department, £1,200; Colonel Sir A. Tulloch, K.C.B., Military Superintendent

of Pensioners, £1,000; Colonel John Crofton, Assistant Military Superintendent of Pensioners, £300; Rev. G. R. Gleig, M.A., Chaplain-General, £950; Lieut.-Col. Lefroy, R.A., Inspector-General of Army Schools, £675; Captain J. C. Caffin, R.N., C.B., Director of Stores and Clothing, £1,200; George D. Ramsay, Esq., Assistant Director of Stores and Clothing, £800; Thomas Howell, Esq., Director of Contracts, £1,500; Samuel Petrie, Esq., Director of the Commissariat, £1,200; R. C. Kirby, Esq., Accountant-General, £1,500; William Brown, Esq., Assistant Accountant-General, £970; C. M. Clode, Esq., Solicitor, £1,200; and R. H. Forman, Esq., Assistant Solicitor, £560.

PENSION TO MR. J. B. LINDSAY, ELECTRICIAN.

We have much pleasure in announcing that the Earl of Derby, on the recommendation of Mr. Henry Drummond, M.P., has placed our townsman, Mr. J. B. Lindsay, on the Literary and Scientific Pension List for £100 per annum. Although not distinguished by name either in the literary or scientific world, a worthier recipient of such a pension could not be found. In self-denying seclusion and long-life study he has lived the life of a hermit, devoted to scholastic research and profound investigation into the arcana of Nature. His Astro-Chronology, and Polyglot of the Lord's Prayer in fifty languages, are surprising productions of learning and ingenuity combined, while his demonstrations of the possibility of holding submarine electric telegraphic communication without wires seem to solve the problem of the Atlantic Telegraph, by informing its projectors that there is no necessity to waste so much time and money in attempting to lay down a costly cable which can be entirely dispensed with. Mr. Henry Drummond happened to be in Dundee when Mr. Lindsay's recent work on Astro-Chronology was published, and was so struck with the merits of the production, that he made considerable inquiry respecting its author, and resolved to use his influence to obtain this pension, which Lord Derby promised on his accession to power, and has now handsomely granted—*Dundee Advertiser.*

[The scientific public will, we think, suspect that this pension has been given in deference to Mr. Drummond, rather than in recognition of scientific researches. Lord Derby must be cautious in exercising his conciliatory powers, and must not attend to the requisitions of every eccentric, as well as of every liberal, member of the House of Commons.—Eds. M. M.]

THE ATLANTIC CABLE APPARATUS.

Gentlemen,—The plan for an electric cable paying-out machine, which "Two Working Mechanics" have submitted to your notice, certainly shows their ingenuity, but not that they have given sufficient thought to the subject. Although criticism is invited, I should not have been prompted on this occasion to offer it, but that we know by experience, that not only, in regard to this particular contrivance, but in reference to the entire subject of the Atlantic Telegraph, both in its electrical and mechanical departments, ideas have been accepted and acted upon, which also would have been all the better if more thought,—or for want of that, as well as in aid of it,—more preliminary experiment had been bestowed upon them.

The fallacy, disguised by its ingenuity, in your correspondent's plan, is this,—that a strain on the cable being assumed to exist independent of, and in addition to, that derived from the retarding mechanism, which when the total amount exceeds the imposed limit releases entirely the frictional resistance, yet, in the face of this assumption, that the result of such existing excess is to "allow the cable to run *free*, so long as an excessive strain *continues*," and "to render it impossible to have a greater strain on the cable than that to which the machine might be set, no matter how much the ship might pitch and roll." Now this additional strain cannot *continue*, do work, and cease to exist at the same time; or, if there be no extraneous strain, and only such as proceeds from the retarding action of the machine itself, it can never exceed the imposed limit, and therefore can never bring any self-releasing action into play. Should your correspondent, in reference to the former branch of the fallacy, admit that the cable would be relieved only of the strain from frictional resistance, then I would observe, that the leverage arrangements in this plan are such, that the extraneous strain must be vastly greater than the frictional strain, before the former could entirely relieve the cable from the latter: but this would occupy too much space to prove. I would only observe that, if on the other hand, the leverage arrangement gave more power to the relieving action, then the ordinary retarding action of the machine would be impaired until it became a nullity.

But whence is the extraneous strain to arise? A strain on the cable can only exist, out of the water, through retardation in its delivery; and apart from the friction of the paying-out machine, there is no-

thing to produce that except the inertia of its parts and a few guiding pulleys; the amount of which must be too trifling to deserve a thought, if, what we have no right to suppose, anything short of insanity was concerned in their construction. Your correspondent, "A. T. C.," has lately given it as his opinion, that an increased velocity of the cable might bring upon it a breaking strain, because, "as the rapidity increases the friction increases likewise:" but this is a mistake; for this kind of resistance is, it is well-known, uniformly constant whatever the velocity. An additional strain, such as the "Two Mechanics" think of, might be produced in a very slight degree, by a sudden increase in the velocity through the inertia to be overcome, but not through a greater degree of friction.

I am, Gentlemen, yours, &c.,
BENJAMIN CHEVERTON.

CHARCOAL A CURE FOR BURNS.—The *Gazette Médicale* of France says that, by an accident, charcoal has been discovered to be a cure for burns. By laying a piece of cold charcoal upon a burn, the pain subsides immediately. By leaving the charcoal on one hour, the wound is healed, as has been demonstrated on several occasions.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

HOLCROFT, G. and G. DENHOLM. *Certain improvements in steam engines.* Dated Dec. 8, 1857. (No. 3032.)

This consists in a horizontal double-acting compound steam engine, the high pressure and low pressure cylinders of which are placed in a line with each other, so that the pistons of both cylinders may be fixed to the same piston rod, and this piston rod is connected to the crank shaft by a connecting rod of the usual construction. By this arrangement a pair of horizontal double-acting compound steam engines may be connected to the same crank shaft, the cranks being placed at right angles. Also in applying rollers or pulleys to support the piston rods of horizontal engines.

SHAW, B. *An improvement or improvements in the construction of windows.* Dated Dec. 8, 1857. (No. 3033.)

This consists in fixing a window upon an axis, or upon centres, so that the window, on being made to perform a semi-revolution upon the axis, will present to the inside of the room the side which was previously outside.

NIGHTINGALE, C. *Improvements in machinery for feeding hair and fibres intended to be spun or twisted.* Dated Dec. 8, 1857. (No. 3036.)

This relates to such coarse parallel fibres as require to be twisted while they are being fed into the spinning machine; and consists in adapting to the machine a rotary mechanical feeder, in which the feeding rollers are made to revolve on their own axes, and also to revolve around a centre at the point where the hair, &c., is introduced between them.

DOLMAN, H. *An improved stand for cheval and other dressing glasses.* Dated Dec. 8, 1857. (No. 3037.)

This stand allows of such glasses being either elevated or depressed, and also swivelled either horizontally or vertically, or both, so as to place and fix the glass in any desired position.

WARD, W. J. *Improvements in dyeing and printing textile fabrics and materials, and in apparatus connected therewith.* Dated Dec. 8, 1857. (No. 3038.)

The patentee claims, 1. Printing or dyeing with indigo mixed with a reducing agent. 2. For the above purpose, and as the reducing agent, the use of glucose, grape, sugar, starch sugar, dextrine, cane sugar, &c. 3. For mixing with indigo, treated as aforesaid, lime and soda, lime and potash, or other combination of alkalies with alkaline earths. 4. The use of indigo previously reduced by glucose, &c., for printing or dyeing. 5. Combining other substances with indigo prepared according to the first claim, to produce various colours. 6. The preparation of a blue vat by reducing the indigo with glucose, &c., and then adding the same to the vat. 7. The use of two or more steam chests between which printed goods to be steamed are passed; also, for the operation of steaming, the use of superheated steam. 8. Causing printed goods to pass direct from the printing machine to the steaming apparatus.

BROOMAN, R. A. *Improvements in cocks and valves for regulating the flow of fluids.* Dated Dec. 8, 1857. (No. 3041.)

This consists, 1. In employing a block or blocks of vulcanised caoutchouc of the kind called in France "Alcalin," through or between which a plate or flat valve is caused to slide by levers or a screw and nut, the said plate or flat valve having formed in it an aperture which may be either brought opposite to a hole or holes in the block or blocks of caoutchouc to allow fluid to pass, or be brought aside from such hole or holes to stop the flow of liquid. 2. In forming the seats of valves generally of the aforesaid description of caoutchouc.

WILLETT, T. W. *Improvements in the manufacture of gunpowder, and in the machinery connected therewith.* Dated Dec. 8, 1857. (No. 3042.)

This consists, 1. In so constructing incorporating gunpowder mills that the beds shall rotate about a vertical axis, while the horizontal axis of the edge runners shall have no other motion than in a vertical plane, and its motion in such vertical plane be so determined that it shall not approach within a given distance of the bed of the mill, which is thus secured from all risk of contact with the edge runners, and from the consequent danger of explosion. The patentee also so constructs the mill that the mill-man can at will raise the axis of the edge runners yet further from the mill bed, and so remove them entirely from all contact with the charge thereon. It consists, 2, in a new form of press cake. 3. In a new arrangement of apparatus for mixing the saltpetre with the charcoal previous to mixing these ingredients with the sulphur, and subjecting them to the action of the incorporating gunpowder mills. 4. In mixing saltpetre in a state of solution with charcoal; for this purpose a common open copper may be used. 5. In a new form of granulating machine.

CLARKE, S. *An improvement in wicks for candles and night lights.* Dated Dec. 9, 1857. (No. 3044.)

Here, the bark is partly removed on two opposite sides, and the rush divided longitudinally, so that, in burning, the two parts turn out from each other and from the flame.

WESTENDARP, C., jun. *Preparing a material as a substitute for ivory, which he proposes calling artificial ivory.* Dated Dec. 9, 1857. (No. 3045.)

The patentee takes small particles of ivory, bone, wood, glass, cotton, wool, &c., and combines them with resinous materials, and by pressure and heat produces a substance of an ivory or a wood-like

appearance, which may be coloured during the process of manufacture, or afterwards.

SMITH, J. *Certain improvements in securing rails in their respective chairs for railroad permanent ways.* Dated Dec. 9, 1857. (No. 3046.)

This consists in making the keys by which the rail is held in the chair of iron. The patentee prefers, instead of striking them, to construct them with a fixed flange on one end clipping the side of the chair, and to apply a flange on the other end of the key, to be secured by a screw bolt passing lengthway through the key.

HADDON, J. *Certain improvements in the manufacture of wood screws, a portion of which is also applicable in the manufacturing of certain descriptions of nails.* Dated Dec. 9, 1857. (No. 3047.)

This consists in applying to machines used for the purposes above indicated a segmental plate, composed of two thin plates of iron held apart the required distance, and working through a slot in the bottom of a hopper, which plate works in end-guides of corresponding curvature, so that, as the segment is lifted up and down (at regular intervals) by a tippet or eccentric and connecting rod, the top edge of the segment when up will assume an angle of about 25°. When the segment is pulled down and the hopper filled with screw or nail blanks, some of them will fall in such a position as to allow their heads to rest on the plates of the segment, with the barrels or bodies of the blanks hanging vertically between the plates, so that, as the segment rises, it carries the blank that it has so gathered up with it, until it assumes the angle before named, when the blanks will descend down the inclination thus given to the segment, and pass from the hopper on to an inclined plane composed of two plates of iron, &c., placed at the same angle as the top edge of the segment is made to take, and form the bottom of this inclined plane. It also relates to the cutter for cutting the thread on the barrel of such screws, and consists in simply forming the cutter so that it shall be capable of compassing two, three, or more threads at the same time.

HODDELL, J. *An improvement in watches.* Dated Dec. 10, 1857. (No. 3049.)

This consists in the use of two main springs, thereby enabling a watch to work eight days.

BIGGIN, S. and J. *Improvements in the construction of the handles of tea and coffee-pots and other similar articles.* Dated Dec. 10, 1857. (No. 3053.)

Here the patentees employ pieces of moulded horn let into the handle, for insulating it from the body of the pot so as to prevent it becoming heated.

CHADWICK, J., and A. ELLIOTT. *Improvements in machinery for spinning, doubling, and throwing silk.* Dated Dec. 11, 1857. (No. 3054.)

The object here is to spin or throw filaments of silk direct from cocoons, and to wind the same on bobbins, &c., also to double and throw threads of silk from bobbins. It refers to a previous patent of the patentee, dated 14th April, 1853, and consists in certain modes of giving the requisite relative velocity to the spindles, bobbins, and flyers, to impart the proper amount of twist to the thread, and to wind it on the bobbin. Also in the application of a friction brake to the wheel driving the spindle, bobbin, and flyer, whereby each spindle, bobbin, and flyer, can be stopped independently of the others.

STATHER, J. *Improvements in producing surfaces in imitation of wood for printing from.* Dated Dec. 11, 1857. (No. 3057.)

The patentee first takes an impression upon a plastic material (preferring gutta percha) from the wood to be imitated, placing the plastic material around a cylinder or upon a block either before or afterwards. The surface of the material thus impressed (when it has become hard or firm) may be used for printing upon paper or other material, so as to produce an impression of the required description. Or from the plastic material he takes another impression, the reverse of the first. This when rigid may be used as a printing surface. He also takes an impression from the surface of a piece of wood upon paper in ordinary printing ink or other glutinous and adhesive matter, and applies the impression thus obtained to the second surface of a block or roller in such manner as to produce a lithographic or zincographic printing surface; or he engraves the surface of the block or roller so that it may be employed in printing. In some cases the patentee prefers, after the surface of the wood has been made smooth and flat, and before the impression is taken, to remove portions of the surface by means of suitable tools, leaving the grain of the wood untouched. And he sometimes takes an impression from the surface of the wood, and by means of pressure transfers the said impression to a metal plate or roller. He then removes those parts of the metal which have received no impression, either by an acid or a graver, and thus produces a metal printing surface corresponding with the natural design of the wood.

DENNE, W. *Improvements in apparatus used for lifting patients off beds and other surfaces used for reclining upon.* Dated Dec. 11, 1857. (No. 3058.)

Here, a frame is used somewhat larger than the surface used to recline upon, and arranged to move in a direction from head to foot, or from side to side; and, when raised, it may be rendered capable of being detached from the bedstead, &c. The frame is provided with straps from side to side, which pass under the patient, so that, when the frame is raised, the patient will be lifted on the straps or supports. It may be made in parts, and formed to admit of one or more parts assuming an inclined position.

ROBERTS, J. and M. BEALE. *Improved machinery for obtaining and applying motive power, applicable chiefly to the working of ships' pumps, and other mechanism on ship board.* Dated Dec. 11, 1857. (No. 3060.)

This relates to the use of a weighted rod for transmitting a driving power to machinery. The patentees propose chiefly to apply the invention to the working of ships' pumps, capstans, and to other like uses on ship board, as they are then enabled to avail themselves of the rolling motion of the vessel to generate motive power.

WALTON, F. *Improvements in the manufacture of rollers used in machinery for preparing and spinning fibrous materials, and for other purposes where elastic pressure is required; also in the machinery employed in the manufacture of the said rollers.* Dated Dec. 12, 1857. (No. 3062.)

This consists, 1. In manufacturing the top rollers of drawing rollers used in preparing and spinning fibrous materials, by covering a spindle with vulcanised india rubber, &c., and in covering the elastic material either with a thin metal tube, or winding a coil of sheet metal or wire over the elastic material. 2. In the application of a pointer to a roller or guide spindle, around which wire is coiled, which pointer and guide spindle consists in coiling the wire on the elastic material forming part of the improved roller. The wire is kept at a uniform tension by a weighted finger.

NORMANN, J. DE and W. T. HENLEY. *Improvements in machinery for preventing the overlapping of chains or ropes when used on drums or shafts, which improvements can be applied to the laying of telegraphic cables.* Dated Dec. 12, 1857. (No. 3065.)

The object here is stated above. The apparatus cannot be described without engravings.

COWPER, C. *Improvements in photography.* (A communication.) Dated Dec. 12, 1857. (No. 3066.)

This relates to the production of photographic images and pictures without salts of silver. Chromium compounds appear to be used, but the precise nature of the method is not stated.

PRÉAUD, J. M. *An improved engine with rotary*

piston applicable to various purposes. (A communication.) Dated Dec. 12, 1857. (No. 3067.)

This is formed of an annular chamber, in which a piston moves. It fills the section exactly, and is connected to a shaft. In the space between the two ports the section of the annular chamber is completely separated by a rotary separating diaphragm and abutment. This has a circular motion in the contrary direction to that of the piston, imparted by the shaft connected with the piston. The part by which the motive piston is connected with its axis, is formed of a thin metal disc, disposed at that part of the piston which enters the interior of the annular space in which the piston moves. This is intended to annul, in a great measure, the pressure communicated to the axis by the action of the fluid on the perimeter of this disc.

CUNNINGHAM, H. D. P. *Improvements in reefing and furling sails.* Dated Dec. 12, 1857. (No. 3068.)

This consists in certain modes of imparting rotation to a revolving yard, spar, or roller, used for reefing or unreefing the square sails of ships by rolling or unrolling the sail attached to the spar or roller. These modes cannot be described without engravings.

BUNTING, H. *Improved apparatus for obtaining and applying motive power.* Dated Dec. 14, 1857. (No. 3070.)

This invention cannot be described without engravings.

BRIGNON, J. P. *Certain improvements in forging.* Dated Dec. 14, 1857. (No. 3071.)

This consists in forging metals by the combined agency of hydraulic pressure and the steam hammer.

PARKER, J. *Certain improvements in the construction of bedsteads.* Dated Dec. 14, 1857. (No. 3073.)

This relates more particularly to bedsteads for the use of invalids. It cannot be described without engravings.

HOGG, J. *An improvement in the manufacture of "copying paper."* Dated Dec. 15, 1857. (No. 3075.)

This consists in impregnating ordinary copying paper with a salt of iron so that, when brought in contact with ink containing tannin, an impression is produced upon the paper.

SMITH, W. *Improvements in chromo-typographical printing presses.* (A communication.) Dated Dec. 15, 1857. (No. 3076.)

This invention cannot be described without engravings.

BRERFIT, E. *Improvements in the manufacture of glass bottles.* Dated Dec. 15, 1857. (No. 3077.)

This consists in the employment of moulds of wood in the production of glass bottles, and particularly of such as are of large dimensions.

BRADLEY, J. *Improvements in ovens applicable for baking bread and pastry, roasting or cooking meats, and similar purposes.* Dated Dec. 15, 1857. (No. 3078.)

This relates to kitchen ovens, which are usually set adjoining the kitchen fire grate, and when used for baking, &c., fire from the grate is pushed underneath to heat the same. The improvement consists in dispensing with fire underneath the oven, by the employment of a pipe or flue applied to the back of the fire grate, having an opening thereto, and communicating with the flues of the oven, which are arranged so that the heated air or gases will be conducted from the fire to the top, sides, bottom, and back of the oven, and thence to the chimney.

CHADWICK, J. *Improvements in rollers or cylinders for printing or staining the surfaces of woven fabrics, yarns, paper, and other materials.* Dated Dec. 15, 1857. (No. 3079.)

This consists of improved modes of employing the metal types at present used in block or surface roller printing. The patentee proposes to fix the types to rollers made of metal, drilled at given intervals, the holes being tapped to receive set screws which pass through the blank parts of the types. In order that the types may be arranged on the rollers with perfect accuracy and register, he employs a machine whereby perfect parallel lines and cross lines can be drawn on two rollers at the same time, and the relative positions determined of each part of the pattern on each roller.

TURNER, E., and J. C. PEARCE. *Improvements in the manufacture of railway wheels.* Dated Dec. 15, 1857. (No. 3080.)

This consists in uniting the tyres and bodies of railway wheels by forming dove-tailed or other grooves or cavities in the inner surfaces of the tyres, and also in the outer surfaces of the wheel bodies or runs, so that when the tyres are shrunk upon the wheels the cavities in the former will correspond with those in the latter. These cavities are filled with fusible metal alloy, poured in through holes or channels formed in the wheel runs, or in the joints of the tyres and runs, or at the angles formed by the junctions of the spokes. There are modifications included.

GALLOWAY, W. and J. *Improvements in hydraulic presses.* Dated Dec. 15, 1857. (No. 3083.)

This has reference chiefly to facilitating the making up of bales of cotton or other bulky substance which requires to be rapidly compressed. The patentees construct a press of the usual height in the columns, and in the top of the press fix an inverted cylinder and ram, to compress the cotton down into the box about two-thirds of the required stroke. The down "follower" is then secured in its position by two strong hanging iron leaves, which, with the ram form the resistance for the lower ram to work against. When this is secured, the lower and larger rams are put to work to complete the compression. As the inverted ram has to perform the highest duty, it is evident that a smaller diameter and area is sufficient, and as it is worked by the same pumps as the larger or main ram, a considerable increase of speed is obtained.

HOWARD, T. *Improvements in machinery or apparatus for rolling iron bars used in the construction of suspension bridges and otherwise.* Dated Dec. 15, 1857. (No. 3084.)

This relates to a previous patent of the patentee, dated Oct. 6, 1845, and consists primarily in the adaptation of moveable collars for adjusting the rollers for variable lengths of bars, and when several enlargements, projections, or, as the patentee formerly termed them, "heads" are required of the same or different forms in the length of the same bar.

EVERITT, G. A. *Improvements in the manufacture of tubes or cylinders of copper or alloys of copper.* Dated Dec. 15, 1857. (No. 3085.)

These relate, 1. To the casting of tubes or cylinders of copper, or alloys of copper under pressure. The moulds or ingots are somewhat similar to those in use, but have a larger sectional area when ready to receive the molten metal than the sectional area of the tube or cylinder required. To obtain this he leaves between the edges of the several parts of the mould spaces or grooves, to be filled with sand, which will act as a cushion in preventing immediate contact of the edges of the mould. Directly the tube or cylinder has been cast he applies pressure to the outside of the mould, closing its parts together. The sand is thus forced out, and the sectional area of the mould being thereby reduced, great compression of the molten metal takes place, and a sound cylinder is produced. 2. To the alloying of copper for subsequent manufacture into tubes or cylinders. This alloy consists of about 8 parts of copper to 1 of good yellow brass, and by its employment the patentee is enabled to produce a tube or cylinder of the colour of copper, and free from the flaws or air-holes to which tubes of pure copper are liable. The tube or cylinder thus cast is afterwards drawn down as a solid or unbrazed tube, and becomes a finished tube for employment as a printing roller, or for other purposes of a solid drawn tube 3. To cleansing or picking tubes or cylinders of copper or alloys of copper during certain stages of

their manufacture; that is to say, prior to every subsequent drawing operation (except the last). He immerses the tubes in a solution of soft soap and water, also applying the same solution to the outside of the tube whilst it is being passed through the dies.

THORNTON, J. *Improvements in apparatus used for the manufacture of carpets and other cut pile fabrics.* Dated Dec. 16, 1857. (No. 3088.)

Here each loom is fitted with a bar across the front, and this bar has affixed to it instruments on which the pile warps are lapped. At the back end of each instrument there is an incline, so arranged that the pile warp acting thereon is caused to ascend on one side and descend on the other side of such instrument. The weaving in respect to the throwing in of the weft or wefts used may be in the ordinary manner. The instruments are each formed with a groove near the bar which carries it, and in this groove is applied a knife, so that as the laps of the pile warp around an instrument is driven towards the bar, by the beating up of the work, the lappings of the pile warp on each of the instruments brought in succession under the action of the knife, and are in succession divided thereby.

HILLS, E. *Improvements in the manufacture of white lead, and in the working up of the waste materials.* Dated Dec. 16, 1857. (No. 3091.)

This consists in roasting galena, so as to obtain either sulphur or sulphurous acid; then smelting the residue, and converting the metal into white lead in the usual manner. The spent tan, in which the stacks of lead are set, may be distilled to recover acetic acid after it has served for one or more operations.

GREGORY, H. *Certain improvements in machinery or apparatus for making "lozenges," or other similar articles.* Dated Dec. 16, 1857. (No. 3092.)

This consists of a pair of cylinders mounted in a framing, each divided in its circumference into quarters, forming four rows of moulds, each furnished with an internal plunger, worked by means which cannot be intelligibly described without engravings.

TURNER, M. J., and M. W. *The improvement of conduit pipes and tubes for the sewers, drains, conduits, gas, and other purposes.* Dated Dec. 17, 1857. (No. 3095.)

This consists in the manufacturing of glass formed into conduit tubes or pipes and drains, for the conveyance of water and gases.

DAVIS, J. J. *Improvements in presses for printing or endorsing and embossing.* Dated Dec. 17, 1857. (No. 3098.)

These relate to presses used principally for embossing or printing addresses on letter paper, envelopes, &c., and consist in so arranging parts that one movement of the lever will cause the descent or motion of the printing surface, by which that surface will be inked; also, that another movement of the first mover causes the descent or motion of the printing surface, by which the printing or embossing will be effected.

HIGHTON, E. *Improvements in electric telegraphs.* Dated Dec. 17, 1857. (No. 3101.)

This relates, 1. To the gold leaf telegraph, for which a patent was granted to the Rev. H. Highton, Feb. 3rd, 1846, and consists in the use of an electro-magnet instead of a permanent magnet as therein described. 2. In recording signs made by telegraphic instruments by means of photography. Hitherto paper has been mechanically marked, or marked by means of chemical decomposition, or the motion of a pointer either oscillating between two stops or revolving round a dial. The improvement consists in recording photographically the signals thus produced. 3. The patentee employs tubes made of cast-iron, and of a triangular form, for protecting telegraph wires when buried in the ground, and in laying the same he places them with the apex upwards, so that a pickaxe coming in contact with the inclined sides of the tube glances off, and fracture is thus avoided. 4. Of a peculiar form of code table sea diagram, which is capable of producing upwards of two million different numbers for each inhabitant of the world, reckoning the number at five hundred million.

JOHNSON, H. *Improvements in apparatus for drawing geometric curves.* Dated Dec. 17, 1857. (No. 3102.)

This consists of a bar held in a vertical position against a plane, and furnished with a metal point. To this bar is attached one end of a horizontal rod. The upright passes through the rod, or small block fixed upon the end of it, so that the rod may revolve round the bar as a centre. The outer end of the rod is furnished with a drum or pulley, over which a chain passes. One end of this chain is fixed to the centre upon a level with the pulley, and the other end, after passing over the pulley, returns and is attached to a slide which carries a pencil. The rod is caused to revolve round the bar, and the chain is thus wound round the bar, each succeeding coil enclosing the preceding one; and the slide is drawn from the centre towards the pulley at the outer end of the rod, by which a curve is traced by the pencil, progressively increasing as it is drawn from the centre. The centre is furnished with tubes, one or more of which can be pushed down to increase the size of the centre when required. Any modification of the size or shape of the centre, or of the size of the chain, will affect the curve described by the pencil.

HOWELL, J. B., and J. SHORTRIDGE. *An improved mode of rolling steel for springs.* Dated Dec. 18, 1857. (No. 3107.)

This consists in the use of a pair or pairs of rolls, one of which is turned eccentrically, and the other plain. By this means the spring is rolled out, bevelled, or tapered at each end at one operation, and a series of springs produced according to the length of the bar of steel passed through the rolls.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

LAVATER, M. L. J. *Improvements in laying down telegraphic cables in the sea.* Dated Dec. 7, 1857. (No. 3026.)

The cable is to be wound ashore upon a floating drum, and to be unrolled out at sea by the axles of the drum being fastened by chains to a steam tug. The same means might be used when modified in taking the cable out of the sea.

COLE, C. *Improvements in leather.* Dated Dec. 7, 1857. (No. 3027.)

This relates to the production of sheets of leather by treating scraps and shreds of leather in the same manner as materials for making paper, mixing the pulp with size and then rolling it into sheets.

STIFF, J. *Improvements in drain pipes.* Dated Dec. 7, 1857. (No. 3028.)

This consists in making drain pipes with standards or feet, and of greater thickness in that part which has to bear the superincumbent weight.

GREENWELL, G. C., and W. SELBY. *An improved machine for washing coals and other minerals, and for separating them from other substances.* Dated Dec. 7, 1857. (No. 3029.)

This consists of a series of shoots arranged in a spiral form, so that the agitation produced by the descending force of a column of water shall separate coal or other minerals from foreign substances, the one being carried forward by the current, and the other falling into the angles of the shoots behind the traps, whence it escapes.

REEVES, R. and J. *Improvements in implements for depositing seed and manure.* Dated Dec. 7, 1857. (No. 3031.)

Here the instruments for regulating the quantity of seed or manure to be deposited on the land are attached to the coulter levers, and the measured quantity of seed or manure is at once deposited on

the land, in place of being conveyed away by pipes, or otherwise, before being so deposited.

PRESHOUSE, H. *An improvement or improvements in stereoscopes.* Dated Dec. 8, 1857. (No. 3034.)

This consists in making the end of the instrument in which the lenses are inserted engage with the body of the instrument by a lateral sliding motion, the said end being drawn from off the body by a motion similar to that of the sliding lid of a colour box. The inventor prefers to insert a spring in one of the grooves in which the bed slides, for producing such an amount of friction as will prevent the end from sliding out by its own weight.

OUTRAM, E. *An improved steam regulator.* Dated Dec. 8, 1857. (No. 3035.)

This consists of a vessel to which is attached one limb of an inverted syphon containing mercury, &c. The steam is admitted through a valve into this vessel, and thence wherever required, the valve being worked by a float in the mercury, &c., in one limb of the syphon, the valve being connected to the float by levers or otherwise, so as to cause it to close or open as the pressure increases or diminishes beyond the required amount.

NEWTON, W. E. *Certain improvements in obtaining motive power.* (A communication.) Dated Dec. 8, 1857. (No. 3039.)

This relates, 1. To operating an engine by the employment (in conjunction with, but unmixed with, steam) of the gaseous products of the combustion of coal, &c., in a closed furnace which is supplied with compressed air, together with such air as may be unconsumed in passing through the said furnace. 2. To the generation of steam in a boiler heated by a closed furnace which is supplied with compressed air, and the admixture with such steam of the gaseous products of combustion of the coal or other fuel consumed in the said furnace, and such portion of compressed air as may not be consumed therein, and the employment of such mixture as a motive agent to actuate the piston of an engine.

ROWAN, W. *Improvements in spinning flax and other fibrous material, in preparing the same for weaving, and in the machinery employed therein.* Dated Dec. 8, 1857. (No. 3040.)

The object here is the superseding of the present intermediate processes of reeling, drying, and winding the yarn. The inventor makes use of the present machinery for spinning the yarn up to that point when it is wound on the spools or bobbins. These bobbins he makes with flanges on their lower ends only, and of a form similar to those used in the shuttles employed in the loom for weaving, and applies these in the spinning frame in spindles with flyers and drags as at present. To regulate the winding of the yarn on these bobbins he gives a reciprocating motion to the frame carrying them, as is now done, and with the same appliances as now used, that is, by the "heart motion," with this difference, that he makes the traverse produced by it less than at present, and in addition to the traverse imparts a secondary motion to the frame and bobbins carried by it, causing them to fall slowly, and thus, by these two motions combined, the yarn is wound on the bobbins in the manner best adapted for weaving. When considered necessary he fixes a steam pipe across the spinning frame near the bobbins to assist in drying the yarn, and takes the bobbins, whether dried or not, direct from the spinning frame to the looms for weaving when it is weft yarn on them; or, if warp yarn, he takes them to the warping-machine, and fixes them horizontally on spindles, allowing the yarn to be drawn off from their ends in a similar manner as obtained in the shuttle in weaving.

RIDDLE, W. *Improvements in steam engines.* Dated Dec. 9, 1857. (No. 3048.)

This invention consists, 1. In an arrangement of apparatus for using gas mixed with atmospheric air passed through wire gauze for heating steam boilers. Another part of it consists in applying gas through burners or orifices to the steam cylinder, to increase the heat of it, and of the steam entering it. Another part consists in driving rotary valves with an intermittent motion. Another in the use of springs wound up by the action of the fly wheel, or some other part of the engine, which, being released when necessary, shall open and shut the valves of the engine. Another part consists in a certain reciprocating rotative valve, intended for an expansion valve. Another consists in regulating the speed of the engine by the governor being caused to vary the expansion, but by increasing or diminishing the speed of the valve itself. Another, in using two or more fly wheels connected by springs, and being on separate axes, or one or more of the wheels loose on the shaft, this arrangement being intended to steady the motion of the engine.

COX, R. R. *Improvements in the manufacture of fire-lighters, and in apparatus or stoves for burning the same.* Dated Dec. 10, 1857. (No. 3050.)

These consist in manufacturing fire lighters of a composition of about 48 parts of cow-dung, 24 saw-dust, 21 tar, 10 resin, and 4 of coal-dust. The apparatus consists of a case of sheet iron, with cross bars for carrying the fire lighter, and the top of the case is so arranged as to be adapted for supporting a saucepan, &c.

THEE-KATZ, G. *An improved registering and controlling apparatus for hackney coach and other public carriages.* Dated Dec. 10, 1857. (No. 3051.)

This apparatus is fitted in the common coach side lantern. The outside is made of a glass plate, divided somewhat like a compass card into a number of radii, every other one of which is painted with an opaque white colour, whilst the intermediate ones are left unpainted. A moveable glass disc, divided in the same manner as the former, is placed behind this glass plate inside the lantern, on an axis which is under the command of the coachman; every other radius of the said disc is painted red or any other colour, whilst the intermediate ones have merely a number beginning at one and rising to the highest. The apparatus cannot be completely described without engravings.

BEST, J. A. *A new or improved mode of manufacturing printing types.* Dated Dec. 10, 1857. (No. 3052.)

This consists in forming the printing type of two parts, one part of copper, brass, &c., and the other of ordinary type metal; thus the printing surface or head, with the beard or shoulder and part of the body of the type is made of copper, brass, &c., which being complete and finished is placed in a matrix or mould the size of the body, and the type metal portion cast upon it in the said matrix. The heads of the types are made as follows:—Having prepared suitable moulds, the inventor causes the copper, &c., to be deposited therein by the ordinary process of electro metallurgy. He then clips away the superfluous metal with clipping tools and presses. The deposited portion thus finished he places in the matrix, and casts the common type metal portion upon it, which becomes firmly united to it by the rough interior of the deposited portion of the body.

TANTON, J. *Improvements in shepherds' crooks.* Dated Dec. 11, 1857. (No. 3055.)

This consists in connecting the crook to the handle by a short thick piece of india rubber, which is sufficiently stiff to sustain the hook as if it were a rigid staff, and at the same time is sufficiently flexible to allow of the hook being deflected in any direction; and also permits of a twisting action between the staff and the crook, so that no matter how the sheep may twist or flounder about after it is caught hold of by the leg (the shepherd at the same time holding on by the staff), it cannot injure itself while being so held.

GEDGE, J. *Improvements in the process of rec-*

tifying liquids, and in the apparatus used therewith. (A communication.) Dated Dec. 11, 1857. (No. 3056.)

This consists in the introduction of a vertical tube through the boiler to the chamber immediately above it, for separating the essential oils from the alcohol.

HALL, N. R. *An apparatus for registering the phases and age of the moon.* Dated Dec. 11, 1857. (No. 3059.)

This consists of a case, in the base of which an escapement wheel, formed with thirty teeth mounted horizontally upon a vertical spindle, so as to be readily acted upon through the medium of a thumb stud movement, is caused to revolve in connexion with a ball or globe representing the moon upon its hemisphere, and the age thereof upon a horizontal disc or dial, so as to require one tooth to be advanced correspondingly to the day and order set out upon the dial, each successive change being made during the day until the end of the month, when the apparatus will require re-adjusting for the ensuing month.

PARKER, J. *A novel application of steam power for the movement of vessels or other bodies floating on, or suspended in, water, air, or other fluid, and for moving machinery and propelling solid bodies on land.* Dated Dec. 12, 1857. (No. 3061.)

The inventor obtains what he terms the recoil power, by discharging steam continuously, or at intervals, and at high pressure, from a steam boiler. He directs the jet or jets of steam against projections placed on the circumference of a wheel, which is forced round by the steam discharges. Through the centre of this wheel runs a shaft or axle, by which the motion may be communicated for any purposes desired.

PULS, F. *A new combination of mineral substances for the production of artificial stone.* Dated Dec. 12, 1857. (No. 3063.)

This refers to the production of artificial stone for grindstones, whetstones, oilstones, hones, lithographic stones, and stones for ornamental purposes, and as a substitute for meerschaum, and consists in the combination of powdered emery, flint, glass, ruby, diamond, melted alumina, oxide of iron, with proportionate quantities of lime, barytes, plaster of Paris or chalk, and silicate of potash or soda, or potash and soda powdered in solution or in a semi-fluid state.

UREN, W. *Improvements in machinery for cleaning and dressing minerals.* Dated Dec. 12, 1857. (No. 3064.)

This invention cannot be described without engravings.

OLDFIELD, J. *Improvements in machinery or apparatus for cutting and separating fur, or hair, or wool, from hides or skins, which said improvements are also applicable to cutting vegetable or other fibrous materials.* Dated Dec. 14, 1857. (No. 3069.)

This consists in a metallic shaft, mounted in a framing, upon the periphery of which is a series of ribs or leaves, having bevelled edges in the direction of the length of the shaft, and parallel with each other. Beneath this shaft a vertical knife is placed, to cut the fur from the skin, which is distended between two pairs of rollers, one pair with plain surfaces to deliver the skin, and the second pair having fluted or roughened surfaces to draw the skin through the machine. When the skin is thus distended, if the heavy side next the knife of the ribbed shaft be caused to rotate, the skin will be continuously struck upon the edge of the knife by each succeeding rib, and thus the fur or hair will be cut from the skin; and as the shaft carrying the ribs continues its revolution, the rollers are so arranged that the ribs may strike the skin beyond the knife, giving to it slight vibration, and thereby causing a fresh portion to be drawn from the delivery rollers to be fed between the knife and beaters, and allowing the fluted rollers to take up the skin after passing over a suitable guide. The fur falls on to an endless traversing band, and is conveyed away.

LITTLE, W. *Improvements in lamps.* Dated Dec. 14, 1857. (No. 3072.)

An outer cylinder, closed at the bottom except where the wick passes to the spirit vessel below, is used; the upper end is open that the air may freely descend into the cylinder. The outer wick tube is of less diameter than the cylinder, and it is fixed concentrically therein, the air passing downwards between the tube and the cylinder. The lower ends of the wick tubes are for the most part closed, and do not descend to the bottom of the cylinder, that the air may pass freely into the inner wick tube, and through it to the interior of the flame. The wick within the wick tubes is cylindrical, but its lower end is formed to descend through a passage which connects the wick tube with the bottom of the cylinder. The air to the outer surface of the flame passes up a cone supported by the gallery, and a small button is used in the interior of the flame. That an extensive supply of spirit or hydro-carbon may be contained in a lamp, and yet allow of keeping the vessel into which the lower end of the wick passes as high as possible, a second vessel is used to keep an additional supply, and to such vessel apparatus is applied which (when the upper supply is nearly consumed), on being set in action, raises the lower supply into the upper vessel.

BAIRD, A. *Improvements in regulating the supply of water and other fluids for domestic and other purposes.* Dated Dec. 14, 1857. (No. 3074.)

The object here is to remove out of the way of frost all ball taps, wires, levers, &c., as also to regulate the whole of the various cisterns connected with a building, whether on the same or different levels with the supply cistern, by one valve action out of the way of frost, and, if necessary, under lock and key.

BEDWELL, F. *Improved means of communicating between the passengers and guard, and the guard and engine driver, upon railways.* Dated Dec. 15, 1857. (No. 3081.)

Here, each railway carriage has attached to it a gutta-percha tube, the ends of which are arranged to admit of their being coupled up with the ends of the tubes of other carriages. The tube fixed through each carriage has flexible ends of vulcanised india rubber, connected to metal tubes, and locked together by a spring catch. From the main tubes there are branch tubes which pass into each compartment of a carriage, and which, upon being blown through, sound a whistle near to the guard. Each branch is provided with a stop cock or valve, by which ordinarily the branch is kept closed, and on the main tube there is a stop cock or valve on each side of where the branch is connected, so that the main tube may be closed in one direction, and open in the other. These two cocks or valves are ordinarily open, and one of them is only closed when a passenger wishes to communicate with the guard, by blowing the whistle, and the guard has a similar apparatus to that above described; but the cock or valve on the tube between him and the engine driver is kept closed, except when the guard wishes to sound a whistle on the end of the tube near the engine driver.

SEELEY, J. F. *An improved machine or apparatus for cutting out materials used in the manufacture of boots, shoes, and other coverings for the feet.* Dated Dec. 16, 1857. (No. 3086.)

This consists principally of a roller, on the circumference of which are the knives and prickers, and a cutting board covered with lead over which the material to be cut passes. The cutting boards work in slides, and are propelled by toothed wheels working into racks attached to the cutting boards, which cause them to pass from one end of the machine to the other under the roller upon which the knives and pickers are, which roller is pressed downwards by screws.

Gibson, J. G., and S. Berrisford. *Improvements in looms for weaving, parts of which improvements are applicable to lubricating bearings generally.* Dated Dec. 16, 1857. (No. 3087.)

This relates to a previous patent of the patentee, dated 27th Jan., 1849, and to that part of the invention which refers to looms for weaving ginghams and other fabrics requiring more than one shuttle, so as a greater length and more varieties of patterns can be obtained than by that invention. The invention cannot be described without engravings.

Marland, J. *Improvements in apparatus to facilitate the placing of cop tubes on to spindles.* Dated Dec. 16, 1857. (No. 3089.)

Here a series of mouth pieces or tubular passages are employed corresponding in their distance apart with the distance between the neighbouring spindles of a spinning machine, so that, when the apparatus is held over, the spindles, and the series of cop tubes released, they will descend on to the spindles. By these means several spindles will be simultaneously supplied with cop tubes, in place of the cop tubes being applied by hand in succession on the several spindles.

Semple, M. *Improvements in preserving meat, fruit, vegetables, and other edible substances and fluids.* Dated Dec. 16, 1857. (No. 3090.)

This consists in placing the jar or case containing the materials in a receiver; the case and receiver are exhausted, and the antiseptic gases are admitted into both case and receiver. Then before removing the case from the receiver, the inventor closes the case by screwing down the cover, applies an exhaust tube to a screw tap formed in the jar or case, by which the air is exhausted and the gases admitted, and the screw tap is then closed by a rod or key working through a tight stuffing box.

Dickson, J. H. *Improvements in machinery or apparatus for scutching and hackling flax, hemp, and other similar fibrous materials.* Dated Dec. 16, 1857. (No. 3093.)

This consists in the use of brushes, scrapers, and openers, the processes of scutching and hackling being effected in one machine. The fibres are presented by a pair of fluted nipping rollers, in connexion with a feeding drum, having a partial rotary motion. This drum is moved forward towards the clearers and openers by a screw spindle, so that the fibres (which lay over a leather apron when under treatment) are accurately presented to the action of the clearing and opening apparatus. The openers which first operate on the fibres consist of blades or scrapers attached to rotary arms at gradually diminishing distances from the centre, and are each fitted in their outer flat surfaces with a number of projecting teeth, which incline back slightly, so as not to tear the fibres as they pass through them. The cleaners and brushes consist of brushes attached also to rotary arms, and having spring knives placed within them, for scraping and brushing off the resin and woody matter. The feeding drum is slowly turned round during the time that the fibre is being operated on, so as to present the whole length of fibre successively to the action of the revolving cleaners and openers.

Creeger, J. J. *Improvements in the treatment of India and China grass, pine apple, hemp, flax, and other similar fibrous materials, and in the machinery or apparatus employed therein.* Dated Dec. 16, 1857. (No. 3094.)

The inventor treats all resin-bound fibres, but especially plaintain and India and China grass, by steeping them in warm water, and afterwards washing and wringing them by pressing them between a barrel or drum having an undulating surface, and other smaller drums placed round the first, or between two undulating rollers. In carrying the invention into effect, the fibres &c., are subjected to a series of washings, wringings, and dryings.

PROVISIONAL PROTECTIONS.

Dated June 5, 1858.

1274. W. Hooper, of Mitcham. Improvements in the manufacture of projectiles.

Dated June 28, 1858.

1452. J. Luis, of Welbeck-street. An apparatus permitting the different parts of machinery working in the water of screw vessels with wells to be examined and mended. A communication.

1454. J. Morgan, of Rotherhithe, rope maker. Improvements in machinery or apparatus for manufacturing or spinning rope yarns or other yarns.

1456. J. C. Coombe, of Alfred-place, Newington-causeway, chemist. Improvements in the method of, and apparatus for, manufacturing manures from fecal and other matters.

1458. W. E. Newton, of Chancery-lane. An improved mode of and apparatus for making nails. A communication.

1460. B. Young and P. Brown, of Spa-road, Bermondsey, glue manufacturers. An improved method of collecting and disposing of the sewage of towns or cities.

Dated June 29, 1858.

1464. J. Shaw, of Manchester, mechanic. A machine to manufacture conical paper and other bags.

1466. H. N. Nissen, of Mark-lane, stationer. A method of preparing paper for receiving stains or copies from letters and other writings.

Dated June 30, 1858.

1470. W. S. Wheatcroft, civil engineer, and J. N. Smith, agent, both of Manchester. Improvements in locks, fastenings, or safe-guards, making them self-acting or partially self-acting.

1474. J. Petrie, jun., of Rochdale, ironmonger. Improvements in machinery or apparatus for drying warps of yarn or thread and woven fabrics.

Dated July 1, 1858.

1480. T. Riddell, of Carracon-terrace, Old Ford, gentleman. Improvements in the construction of omnibuses and in breaks to be applied to such, and other wheel carriages.

Dated July 2, 1858.

1482. W. T. Smith, of Lincoln's-inn-fields, surveyor and civil engineer. Improvements in and the combination of certain machinery or apparatus for winnowing, washing, sifting, and separating grain, ballast, sand, shot, minerals, and other materials.

1484. J. Morris, manager, of Salford. An improved construction, or improvements in the construction, of copper rollers or cylinders for printing fabrics.

1488. A. V. Newton, of Chancery-lane. Certain improvements in lamps. A communication.

1490. T. Mellodew, spinner, J. Duxbury, mechanic, and E. Layfield, manager, all of Oldham. Improvements in machinery or apparatus for spinning and doubling or twining cotton and other fibrous materials.

1492. D. Le Souëf, of Twickenham. An improved shaft-bearer, or tug, and an improved manner of affixing the same to the harness. A communication from C. Girardet, of Vienna.

Dated July 3, 1858.

1494. J. Billing, of Abingdon-street, Westminster, architect. Improvements in fireplaces or stoves.

1496. C. Buhring, of Great College-street, Cam-

den-town, gentleman. Improvements in apparatus for filtering liquids and other fluids containing impurities.

1498. W. Bond, engineer, and T. Standing, ironmonger, both of Preston. Improvements in apparatus for churning, mixing, and stirring cream, milk, and other liquids.

1500. J. G. Jennings, of Holland-street, Blackfriars, and T. Culpin, of Royal-hill, Greenwich. Improvements in apparatus for measuring, regulating, and preventing waste when supplying fluids.

1502. J. G. Jennings, of Holland-street, Blackfriars. Improvements in air-bricks, and in bricks for bonding hollow walls.

1504. J. G. Jennings, of Holland-street, Blackfriars, and J. Lovegrove, of Victoria Park-road. Improvements in water-closets, and in apparatus used in ventilating house drains or sewers.

Dated July 5, 1858.

1506. E. Simons, of Birmingham, manufacturer. Improvements in castors for furniture.

1508. G. J. Newbery, of Straitsmouth, Greenwich, artist. Improvements in the manufacture or production of coverings for floors, applicable also to the manufacture of table mats and other articles or coverings.

1510. T. Woolner, of Blue Pits, Lancaster, manufacturer. Improvements in apparatus for feeding steam boilers with water.

1512. J. Greenwood, of South Audley-street, gentleman. Improvements in marine propellers.

Dated July 6, 1858.

1513. J. T. Davies, of Liverpool, provision merchant. An improved lock. A communication from S. Perry, of Newport, U.S.

1515. H. Hughes, of Homerton, engineer. Improvements in gauffering and crimping machines, parts of which are applicable to the manufacture of continuous belts and shutters.

1516. W. E. Newton, of Chancery-lane. Improvements applicable to roller blinds. A communication.

1517. J. Davis, iron master, and T. Evans, engine fitter, both of Ulverston, Lancaster. Improvements in engines to be actuated by steam, air, or gases.

1518. J. Buchanan, of Port Glasgow, N.B., gentleman. Improvements in propelling ships, vessels, and boats.

Dated July 7, 1858.

1519. W. A. Smith, engineer, of Belper, Derby. Improvements in machines for making bricks, tiles, or pipes of clay.

1520. H. C. Schiller, of London. Certain improved apparatus for laying down and recovering submarine telegraphic cables.

1521. J. J. Florance, of Paris, merchant. Improvements in reels or spooling-wheels.

1522. P. Mercier, of Paris, manufacturer. Improvements in the treatment of peat, and in preparing the same for fuel.

1523. J. Holland, japanner, of Gibb-street, Birmingham, and F. Potts, of Moore's-row, Birmingham. Certain improvements in ornamenting metallic bedsteads, and which said improvements are also applicable to the ornamenting of other metallic surfaces.

1524. W. Clissold, of Dudbridge, Gloucester, engineer. Improved machinery for cutting or rasping dyewoods.

1525. T. James, of Saint George's-in-the-East, engineer. Improvements in treating sewage matter.

1526. G. A. B. Chick, of Milk-street, Bristol. An improvement in the preparation of graphite or plumbago or black lead.

1527. G. T. Bousfield, of Loughborough-park, Brixton. Improvements in apparatus for ironing linen and other fabrics. A communication.

1528. J. D. Weston, of West Bromwich, Stafford, manufacturer. Improvements in rolling iron for the manufacture of bolts and pins.

1529. A. W. Sleigh, of Mansell-villas, Wimbledon-park. Improvements in the construction of floating sea barriers or artificial beaches, breakwaters, and batteries.

Dated July 8, 1858.

1531. J. Marland, of Glodwick, Oldham, and J. Widdall, of Abbey-hill, Oldham. An improved self-acting hook or holder to prevent accidents in lifting, hoisting, or winding at coal pits, or other similar purposes.

1532. H. Gidlow, of Atherton, carpenter. Improvements in breaks for steam engines.

1533. J. B. Booth, of Preston, and R. Ashworth, of Heywood. Improvements in the means of stopping or retarding the progress or velocity of railway carriages.

1534. P. F. Demoulin, chemist, and J. Cotelle, manufacturer, both of Paris. Improvements in treating the heavy oils obtained from the distillation of coals, schists, and other hydro-carbons.

1535. T. T. Chellingworth, of West Bromwich, engineer. A high-pressure steam engine.

1536. P. R. Hodge, of Chalcot-crescent, Primrose-hill, civil engineer. Improvements in brewing fermented liquors, and in treating materials used therein for purposes of food.

1537. R. Smith, of Pond-street, Sheffield. An improved adjustable pipe tongs. A communication.

1538. S. Samuels, of New York, U.S., master mariner. Improvements in laying submarine telegraphic cables.

1539. S. Harrison, of Stanhope-street, Clare Market, smith. Improvements in ovens.

1540. R. J. Crickmer, of the Borough-road, Surrey, civil and mechanical engineer. Improvements in treating the sewage of London, and neighbourhood.

1541. R. G. C. Fane, of Upper Brook-street, esquire. Improvements in treating sewage, and in apparatuses to be employed therein.

1542. M. Scott, of Stanhope-street, Hyde-park-gardens. Improvements in constructing breakwaters, and other like structures.

1543. G. Collier, of Halifax, York. Improvements in means or apparatus for the drying of wool and other fibres.

1544. G. Sampson, of Bradford, York, finisher. Improvements in means or apparatus employed in the finishing of woven fabrics.

Dated July 9, 1858.

1545. W. Simons, of Glasgow, ship builder. Improvements in or connected with ships or vessels.

1547. J. Broadley, of Saltaire, York, overlooker. Improvements in means or apparatus employed in weaving.

1549. C. N. Kottula, of Liverpool, soap manufacturer. Improvements in the manufacture of manure.

1551. J. M. Rowan, of Glasgow, engineer. Improvements in manufacturing wrought iron wheels and bosses or centres, and in the mode of, and furnaces for, heating the same during such manufacture. A communication.

PATENT APPLIED FOR WITH COMPLETE SPECIFICATION.

1641. J. V. N. S. Petrziwalsky, of Pall-mall. Improvements in the manufacture of bread, and in apparatus to be employed therein. Dated 20th July, 1858.

NOTICES OF INTENTION TO PROCEED.

(From the "London Gazette," July 27, 1858.)

495. F. E. D. Hast. "Manufacturing stearine." A communication.
520. R. Edwards. "Lighting fires."
526. J. Aked and J. Crabtree. "Weaving."
533. G. Hall. "Cartridges and gun wads."
550. L. E. Fletcher. "Engines and boilers."
554. Sir J. C. Anderson. "Carriages."
563. P. F. Aerts. "Construction of machinery."
568. G. Williams and E. Rowley. "Piling iron."
571. D. Evans. "Furnaces."
574. J. Bramwell. "Preventing the escape of gas."
579. L. Cowell. "Swimming apparatus."
585. J. Le Franc. "Gauges." A communication.
588. J. T. Pitman. "Soap." A communication.
589. J. T. Pitman. "Moulding clay." A communication.
591. E. J. Manwaring. "Stereoscopic apparatus."
600. H. L. Müller. "Printing."
601. C. Atherton. "Furnaces."
603. W. Mould. "Spinning."
607. E. Coulon. "Boilers." A communication.
626. D. A. Hopkins. "Boxes."
628. J. Nuttall. "Looms."
650. J. Bushell and T. Wright. "Vault or cellar coverings."
654. J. A. V. Burq. "Weighing machines."
659. J. R. Breckon and R. Dixon. "Ovens."
670. F. Robinson and E. Cottam. "Presses."
779. W. G. Armstrong. "Projectiles."
786. J. Bailey, E. Oldfield, and S. Oddy. "Driving grindstones and glazers."
810. E. Green. "Implements for harrowing, pulverizing," &c.
811. J. H. Johnson. "Sewing machines." A communication.
856. J. M. Rowan and T. R. Horton. "Engines and boilers."
878. J. J. Lane. "Eylet machines."
947. A. V. Newton. "Paddle-wheels." A communication.
979. W. Hopkinson and J. Dewhurst. "Consuming smoke."
1007. W. Heap. "Pipe joints or couplings."
1010. T. W. Thacker. "Keys."
1292. J. Bunnett. "Floors, roofs, and arches."
1368. T. Steven. "Casting."
1398. W. C. Wilkins. "Lamps."
1458. W. E. Newton. "Making nails." A communication.
1520. H. C. Schiller. "Telegraphic cables."
1545. W. Simons. "Ships or vessels."

The full Titles of the patents in the above List can be ascertained by referring back to their numbers in the Lists of Provisional Protections previously published.

Opposition can be entered to the granting of a Patent to any of the parties in the above List who have given notice of their intention to proceed, within twenty-one days from the date of the Gazette in which the notice appears, by leaving at the Commissioners' office particulars in writing of the objection to the application.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

1640. H. D. P. Cunningham.
1655. S. J. Pittar.
1662. H. W. Ripley.
1680. R. A. Brooman.
1681. T. Petijean.
1691. W. Weallens.
1693. C. Schiele.

LIST OF SEALED PATENTS.

Sealed July 23rd, 1858.

132. J. J. Welch and J. S. Margetson.
134. A. Wall.
157. T. Armitage.
173. R. Coleman.
197. E. F. Dillage.
203. J. Harrison.
287. G. L. Blyth.
300. J. E. Boyd.
688. H. Napier.
711. W. Crowley.
845. J. H. Johnson.
925. E. Hunt and H. D. Pochin.
1133. J. Adamson.

Sealed July 27th, 1858.

159. J. Bethell.
164. R. A. Brooman.
168. H. W. Hart.
169. W. and C. Kaye.
172. J. Newling.
175. T. Taylor, sen., T. Taylor, jun., H. Nelson, and H. Spencer.
180. G. Bartholomew.
184. R. A. Brooman.
185. R. A. Brooman.
186. W. J. Hay.
216. J. Welch.
238. J. Wells.
243. E. Stevens.
248. W. S. Clark.
271. A. V. Newton.
309. W. E. Newton.
341. G. Schaub.
367. W. E. Newton.
678. W. Oldfield.
725. O. Sarony.
770. H. Bauerrichter and C. G. Gottgetreu.
809. C. Mather and H. Charlton.
930. J. H. Bennett.
1016. H. Jackson.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned above.

LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

Dates of Registration.	Nos. in the Register	Proprietors' Names	Addresses.	Subjects of Design.
June 26	993	C. Pinniger, jun.	Rockborne	Bean Cutter.
,,	994	D. Jones	Birmingham	A Fastener.
28	995	H. A. Holdin	do.	Coin Detector.
29	996	Parsons and Harding	Shoreditch	Rival Hat.
30	997	W. Flint	Yorkshire	Sawing Machines.
July 1	998	W. Staples, jun.	Southwark	Water-closet Valve.
3	999	J. Green	Birmingham	Hook.
5	1000	D. Coulson	York	Bedstead.
,,	1001	D. Coulson	do.	do.
6	1002	H. G. and D. Nicoll	Regent-street	Paletôt.
19	1003	C. H. Thew	Whitehaven	Drawspring.
23	1004	A. Pilbeam	Notting-hill	Camp Stool.
24	1005	J. Cramb	Dundee	Stereoscope.

PROVISIONAL REGISTRATIONS.

June 23	4101	E. Russell	Holborn-hill	Union Joint.
,,	4102	W. Wilson	Manchester	Cistern.
28	4103	J. Bowman	Liverpool	Travelling Blocks.
July 7	4104	J. Cowley	Oxford	Washing Machine.
9	4105	Smith and England	Stourbridge	Spade or Shovel.
10	4106	Rees and Sprague	Southwark	Bottle Stopper.
17	4107	G. Schelhorn	Birmingham	Penholder.
22	4108	J. H. Hall	Upper Grosvenor-street	Jar for Blacking, &c.

NOTICE TO CORRESPONDENTS.

Articles and Correspondence designed for insertion in the ensuing Numbers of the *Mechanics' Magazine* must reach the Office by the Tuesday of each week, at the latest. It is highly desirable that they should be forwarded earlier if possible.

CONTENTS OF THIS NUMBER.

LONDON: Printed and Published by Richard Archibald Brooman, of 166, Fleet-street, in the City of London. Sold by A. and W. Galignani, Rue Vivienne, Paris; Hodges and Smith, Dublin; W. C. Campbell and Co., Hamburgh.

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Edited by R. A. Brooman and E. J. Reed, 166, Fleet-street, London, E.C.

BARNARD'S GOLD-WASHER AND ORE-SEPARATOR.

Fig. 1.

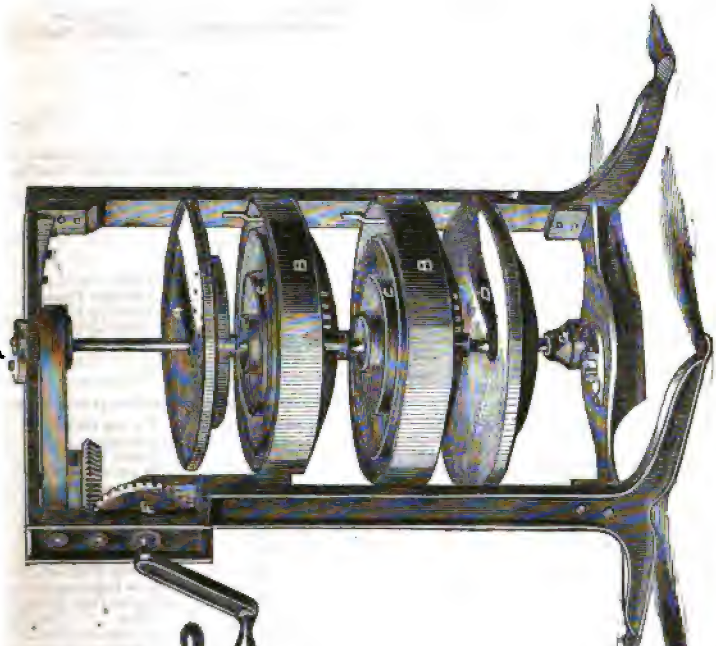
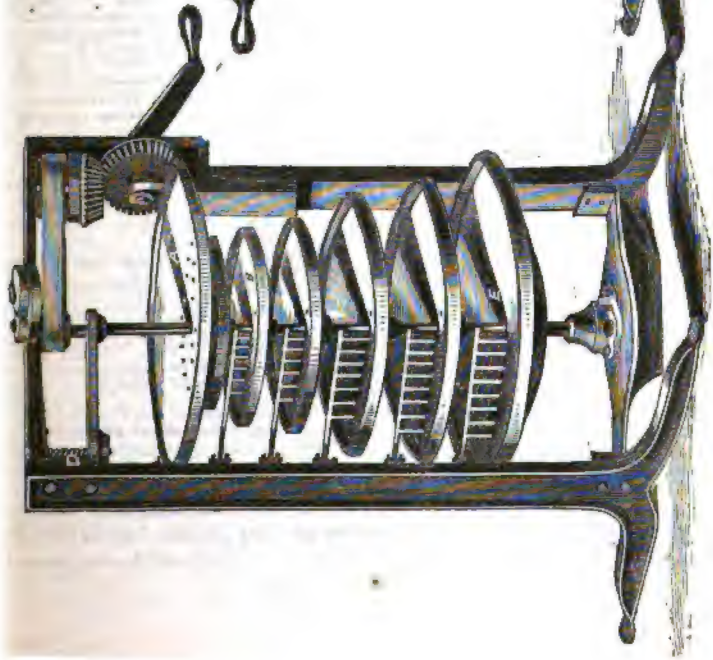


Fig. 2.



BARNARD'S GOLD-WASHER AND ORE-SEPARATOR.

Our engravings* illustrate the invention of H. Barnard, of this city, which is designed to insure the more perfect separation of gold from auriferous quartz, when crushed, or from any other ore, by mechanical means alone, or combined with amalgamation, and also a washer for any kind of ore.

Fig. 1 represents a general gold-washer and separator, and fig. 2 is an amalgamator and separator combined, intended more especially to break up and disintegrate auriferous substances which require severe agitation, such as those combined with clay, manganese, &c., and also to extract the most minute quantities of gold from iron, sand, or crushed quartz, by means of quicksilver.

The inventor has experienced all the changing scenes of a miner's life on both sides of our continent, and he has endeavoured to produce a machine which shall fulfil the want which he himself has felt—namely, one which is simple, durable, portable, and not liable to get out of order; and of his success any miner or mechanic will at once be able to judge. These machines are made of different sizes, to suit the amount of work to be done, the smaller size being about four feet high, and weighing about 250 lbs.

In fig. 1, A is a sieve pan, that separates pebbles, &c., from the finer auriferous substances, which then pass on to a small convex retention rim pan, C, and from that to a large concave retention rim pan, B, being carried through the centre of the pan, B, on to another small convex, C, and over its edge to a large concave, B, and through its centre to the general receiving pan, D, the gold being retained behind the rims. Close at the back of each retention rim is a small hole, which, during the process of washing, is closed with a stopper. In order to collect the gold or ores retained behind the rims, the stoppers are withdrawn, and a stream of clear water introduced at the top, which washes all the ores through the holes into the general receiving pan, D, from which it can be collected into any suitable vessel. By means of an eccentric, F, the vertical shaft which holds the pans is given five vibratory motions to each revolution of the pans by the gearing, E, and by means of the cam, G, it also receives the same number of vertical motions in the same time. Fig. 2 is composed of a series of pans, increasing in diameter, and attached to the shaft by set screws. The substances to be separated are introduced with water by a sluice or race, discharging on to the sieve pan, A, thence passing through holes into the small concave pan, B. C represents a series of agitators, one in each pan, so arranged as to be moved up and down with the pans, always in the same line, by the screw, D. This agitator throws the light waste over the edge of the pan to the one below, which is made broader to receive it, and so on to the next in order, till it passes to the bottom pan, E, the gold being retained in the upper ones. In each of these pans is a hole closed with stoppers, which can be removed to allow the gold to be washed through when desired. In amalgamating, a similar process is carried on, quicksilver being added to the sand and water, and the amalgam is retained or finally caught in the lower pan.

All that is necessary for the perfect operation of the machine is to properly regulate the motion and quantity of water necessary to throw off the waste matter.—*Scientific American.*

INTERNATIONAL PATENT RIGHT.

It is well known to our readers that every foreigner under the sun is as free to obtain the protection of the British Crown for any invention he may make as the best of Her Majesty's subjects, and is charged no more for his protection than we are ourselves. And, it appears to us that, if every foreign Government afforded us like advantages, all would be done that can equitably and reasonably be desired in respect to the establishment of international patent right. There are, however, individuals so little capable of being satisfied with arrangements which are merely just and simple, that a bill was recently introduced into the House of Commons by Mr. Seymour Fitzgerald, the Under-Secretary of State for Foreign Affairs, Mr. Henley, and Mr. Hardy, to improve upon our laws in the matter of international patent right.

The object of the bill, as stated in the preamble, is to provide for the protection, in Her Majesty's dominions, of "the inventions of persons who may have obtained patents, or like privileges, for their useful inventions in foreign countries, where like protection is obtained in such foreign countries for inventions in respect of which

* See preceding page.

patents are granted in this country;" and the bill provides that the inventions of such persons shall be protected in Great Britain by the simple registration and certification of the foreign patent under this Act. The bill is necessarily prospective, and can only be made operative by the enactment of similar laws in foreign states, since no reciprocal law at present exists in any country whatever. Should such laws be enacted, however, the effect of the proposed measure would be, not only to afford the subjects of foreign powers privileges far beyond, in the main, any which British subjects could derive in return, but also to subvert to a great extent, if not altogether, the British patent law as applied to the subjects of Great Britain. For, the fees under the proposed Act being less than those under the patent law—and that they must be made so is certain, otherwise the new bill would offer no advantages to foreigners, every foreigner having at present precisely the same privileges as our own subjects in respect to the protection of inventions—the fees being, we say, less under the proposed measure, an Englishman would be perfectly competent under that measure to patent his invention abroad, and then register it here at the reduced fee. The clause providing for this anomalous arrangement is not more remarkable than another (the last) in the same bill, which actually makes the levying of fees under the proposed bill conformable to an Act which, in so far as it related to fees, was repealed several years since!

The foregoing facts indicate the character of the bill, upon which we will here say no more—although very much more might be said. We wish, however, to explain the circumstances connected with its introduction into Parliament, and the progress there made by it. About the middle of last week it was discovered by persons interested in the patent law that such a bill had been introduced and read three times in the House of Commons, with a speed which was extraordinary even at that period of the session. Inquiry was immediately made, when a state of things came to light which implies a remarkable want of unanimity on the part of Her Majesty's present advisers. Will it be believed that this bill, which affects most materially a large class of British subjects, as well as foreigners, was introduced into the House of Commons by three members of the Government who have nothing whatever to do with patent matters, and smuggled through its three readings without the least reference to, and even without the knowledge of, the present Lord Chancellor, the Master of the Rolls, the Attorney-General, and the Solicitor-General—the four principal Commissioners for Patents? Such was, however, the fact. When it reached the House of Lords a vigilant functionary—not a Lord himself—at once discovered its absurd and revolutionary character, and got it consigned to a place where many a better bill, but no worse, has lately gone.

Some clue to the legislative mystery by which this bill was all but made law will be sought. This we cannot pretend to give. If, however, the present Government did not owe its origin to its avowed opposition to *all* foreign interference with the domestic affairs of this country, we might look for a clue in the direction of South Kensington, where a power not altogether English has recently fought and lost a battle with the Patent Commissioners, the latter fighting and winning in the people's interest.

THE ISTHMUS OF SUEZ CANAL.

The *Austrian Gazette* of the 18th of June published a letter under the signature of "The Chevalier de Negrelli, Engineer," on the subject of a speech delivered by Mr. Robert Stephenson, M.P., on the 1st of June last, in the House of Commons, in the debate on the Suez Canal. This letter of M. de Negrelli, with whom Mr. Stephenson was associated in the first investigation of the practicability of piercing the isthmus, and who now questions Mr. Stephenson's statements in Parliament, and joins issue with him both as to his facts and conclusions, has, Mr. Stephenson considers, rendered it imperative that he should declare in a formal manner what are the facts of the case, and by what circumstances his opinions are supported. He has accordingly addressed a letter to the *Austrian Gazette*, and forwarded it for publication to the English journals. We have not space for the whole of Mr. Stephenson's communication, but shall give the substance of it, as far as possible, in his own words.

In the year 1846 Mr. Stephenson was solicited by his friend, M. Talabot, one of the most eminent engineers of France, to investigate with him the practicability of piercing the Isthmus of Suez for a ship canal. The project had been suggested to M. Talabot by Linant Bey, a French engineer, many years resident in Egypt. The statements submitted were so remarkable that they engaged Mr. Stephenson's co-operation in the interests of science; and, M. de Negrelli having been secured by M. Talabot as a coadjutor, the three entered into a formal agreement to share the labours and the cost of a preliminary investigation.

The construction of a canal through the Isthmus of Suez involved two classes of engineering works:—1, the construction and proper maintenance of the canal itself; 2, the formation and maintenance of sea ports and deep entrances to the canal both on the Red Sea and in the Mediterranean. It has been generally believed that the ancient canal, of which vestiges may still be seen near Suez, was filled by the waters of the Nile, obtained at Cairo; and history had declared that Alexander the Great, in founding the port of Alexandria on the west side of the Delta of the Nile, had been influenced by consideration of the fact, that along the coast of the Levant there is an almost invariable current from west to east, carrying the *débris* poured from the mouths of the Nile into the Bay of Pelusium, and thereby rendering the maintenance of a deep harbour in that bay as difficult as at the mouths of the Danube or the Rhone. But, on the other hand, Linant Bey submitted that the French engineers under M. Lepère, who had accompanied the expedition to Egypt in 1799, had satisfactorily established that there was a difference between the levels of the Red Sea and the Mediterranean of no less than 9·90 metres. Under such circumstances it was apparent that nothing would be easier than to open a channel and establish a sufficient current from the Red Sea to the Mediterranean, with a velocity which it was assumed would keep the canal open by its scour, and maintain a clear channel, not only in the canal itself, but in the harbour in the Mediterranean.

It was under the impression of the existence of this difference of level that M. Talabot and Mr. Stephenson entered on the inquiry; and, as M. de Negrelli was engaged in it at M. Talabot's instance, the same primary consideration must have influenced him. Their first joint act was to take measures to confirm the difference of level reported on M. Lepère's authority. Under the direction of M. Talabot a corps of scientific engineers was sent to Egypt to take the levels, upon which they were occupied from about Sept., 1846, until Jan., 1847, when M. Bourdaloue, the chief of the expedition, reported to M. Talabot that it had been ascertained beyond the possibility of doubt, uncertainty, or question, that M. Lepère had been mistaken; that no difference of level existed; and that, consequently, a canal capable of being scoured by the waters either of the Red Sea or the Mediterranean was impracticable, especially as both seas are nearly tideless.

Upon the accounts and levels submitted to him M. Talabot made a report, which, says Mr. Stephenson, "whether considered in an historical, scientific, or engineering point of view, is at once the most comprehensive and logical document that has ever appeared upon the subject." After reporting on the non-existence of a difference between the levels of the seas and on the effects of the current along the shores of the coast, he concluded that the maintenance of a channel, and of an entrance in the Bay of Pelusium, to the east of the Delta, was "*une difficulté insurmontable*;" and from this he went on to show that, even supposing an entrance could be established to a canal in the bay, the prevalence of north winds during nine months of the year on that part of the coast would prevent ships from attempting with safety either to make it or to leave it, unless a harbour of refuge were established to save them from the consequences of being blown on a lee-shore; and, after alluding to the difficulty of executing such works, he says, "I am persuaded that to construct in the Bay of Tineh a safe roadstead, and a conveniently situated channel, as much would have to be expended as for making the whole of a canal by the way of Alexandria, and that only to obtain a pass of uncertain success, or, rather, one that is certainly impracticable." And M. Talabot concluded that the result was "to exclude every project which shall end in the Bay of Tineh" (Pelusium).

Concurring entirely in these conclusions, and regarding the project as wholly at an end, Mr. Stephenson paid from his own personal means his share of the expenses attending the inquiry (one-third of about 4,500*l.*), and all correspondence on the subject ceased. Several years afterwards —in August, 1855, during the Exposition —he met both M. Talabot and M. de Negrelli in Paris, but so utterly was the project abandoned that no word passed between them on the subject.

In the autumn of 1850, fatigued by the labours of an arduous year, Mr. Stephenson sought health and recreation in a yacht voyage to the Mediterranean. Arrived at Alexandria, he determined to make a personal investigation of the district in which four years previously he had been so deeply interested. Proceeding from Cairo by the usual route to Suez, he turned thence northwards into the Desert, visited the site of the Bitter Lakes (now dry and desolate), encamped for two days at Lake Timsah, and thence proceeded over the high ground towards Lake Ballah, travelling on foot— for it is difficult to traverse otherwise a large portion of the Deserts. From that ridge of comparatively elevated ground he overlooked the district towards Lake Menzaleh, which, during the period of high

Nile, becomes a shallow lagoon, stretching along the coast and far into the Desert. Then, returning westward, he entered the Ouadee Toumilat, at Sababiar, and, following the course of the ancient canal, travelled in the direction of Bulbies and of the ruins of the ancient Bubastis, visiting the higher grounds to the north, and thence returning to Cairo. Altogether he spent fifteen or sixteen days in the district; "and all that I saw and ascertained on this expedition confirmed," he says, "my convictions as to the Suez Canal project, and the finality of M. Talabot's report." On his return to England he gave, on the 20th of May, 1851, an account of this expedition at the Institution of Civil Engineers, and a report of his speech was published with *Minutes of the Proceedings of the Institution of Civil Engineers*, vol. x., pp. 10—13. Yet M. de Negrelli insinuates in his letter—first, that Mr. Stephenson has never been in the locality at all; then, that if he has he "can only have seen that part of the isthmus which is near to Suez!" Mr. Stephenson resents with much spirit what he denominates the "audacious assurance" of M. de Negrelli.

It happens that his journey over this district in 1850 was not his only expedition to it. In the year 1851 his yacht was burnt at Cowes, having on board all the specimens he had collected at the Bitter Lakes, Lake Timsah, and the elevated ridge to the north. In the winter of 1854, being at Cairo, and desiring to replace these specimens, he started for the district, pursuing the same route with little variation; renewing his acquaintance with the physical features of the country, and still further confirming his views as to the soundness of M. Talabot's report.

In the year following this expedition, "certain gentlemen," says Mr. Stephenson, "waited on me in London, and proposed to reopen the scheme for a canal across the Isthmus of Suez. They had no new facts to offer to my consideration, and in all that they stated I found nothing that engaged any share of my confidence, or that in any way changed my views as to M. Talabot's report and the character of the project. In dealing with the multitude of schemes from time to time submitted to me, I have uniformly declined to allow my name to be associated with any plan involving the subscriptions of my fellow-countrymen for which I did not see good prospect of success. Acting on this principle, and feeling that the Suez Canal project on such foundations was not a sound undertaking, I declined to be in any way connected with the scheme. I communicated this resolution to the promoters civilly and courteously. I know not why my persistence in it has given them so much offence. For some years past, however, I have been pursued by these parties, in their hired organs, with weekly attacks on both my personal and professional character. As I have said before, I have thought it most dignified to leave such attacks unnoticed, knowing whence they proceeded; indeed, they appeared beneath notice. Under no circumstances will they ever engage my attention, and it is only when I find a former colleague leagued with my assailants that it appears to me to be necessary to correct his misstatements."

M. de Negrelli, in his letter, compares the proposed canal to the Thames, and says:—"If my hon. friend will look from the windows of the building in which he has developed such singular hydraulic knowledge, he will see that the reflux of the Thames as far as Windsor is caused by the rising of the tide and the agitation communicated to the river. Notwithstanding that Windsor is many leagues from the sea, the influence of the tide on the interior waters is regularly felt. In the same manner the Mediterranean and the Red Sea will agitate the Suez Canal. The waters will rise and fall; in one word, they will take part in all the movements of the sea." Mr. Stephenson very properly replies, that to suppose for a moment "that there is any analogy between the Suez Canal, 300 feet wide at its mouth, in an almost tideless sea, and a river like the Thames, no less than six miles broad at the Nore, with a rise of tidal water of from 16 to 20 feet, is really, to use a favourite phrase of M. de Negrelli, merely to 'pretend' to a knowledge of hydraulics;" and he cleverly adds, "If, without a shadow of foundation, M. de Negrelli questions my ever having been at Suez, it is not without foundation that I shall question his ever having been at Windsor. * * * For, while it is quite true, as M. de Negrelli says, that 'Windsor is many leagues from the sea,' it is equally certain that 'the influence of the tide there is' not 'regularly felt,' inasmuch as it is arrested by Teddington lock. Moreover, I must inform M. de Negrelli that Windsor is 26 miles above the reach of the Thames, and that at no period of the history of the river, even before the construction of the locks, was the tide known to reach within 22 miles of that town. In the same manner, therefore, as the tide agitates the waters at Windsor, M. de Negrelli pronounces that 'the Mediterranean and the Red Sea will agitate the Suez Canal.' On this point 'I do share the opinion of my hon. friend' in Austria."

On the graver question that "the waters

of the canal will rise and fall, and that they will take part in all movements of the sea," he does not, however, share M. de Negrelli's opinions. Mr. Stephenson regrets, that, after leaving M. Talabot and himself to imagine, for so long a period, that he concurred in the conclusions at which they arrived, he should now have pronounced a contrary view. He remarks, however, that in the meantime his own views have been strongly confirmed. Among other important inquiries on the subject, he refers to a document issued by the Hydrographic Office of the Admiralty, under the authority of Capt. Spratt, R.N., C.B., F.R.S., who, in 1857, made "an inquiry into the soundness of M. de Lesseps's reasonings and arguments on the practicability of the Suez Canal." This eminently scientific officer has arrived at the conclusion, after 20 years' hydrographic experience of the Mediterranean, and after the late elaborate surveys and charts of the Admiralty, showing the wave motion and the currents, that the establishment of a canal "dependent upon or secondary to the practicability of making and maintaining a deep entrance to it from the tideless Mediterranean," is not feasible.

In conclusion, Mr. Stephenson states that he has no hostility to a maritime canal through the Isthmus of Suez. "If I could regard such a canal as commercially advantageous, I have already shown," he says, "that I should be the first to give it the advantage of my time, my money, and my experience. It was because, after elaborate investigation, and in conjunction with such men as M. Talabot, I arrived at a clear conclusion that the project was not one which deserved serious attention, that I refused to give it support. I should be delighted to see a channel like the Dardanelles or the Bosphorus penetrating the isthmus that divides the Red Sea from the Mediterranean; but I know that such a channel is impracticable,— that nothing can be effected, even by the most unlimited expenditure of time and life and money, beyond the formation of a stagnant ditch between two almost tideless seas, unapproachable by large ships under any circumstances, and only capable of being used by small vessels when the prevalent winds permit their exit and their entrance. I believe that the project will prove abortive in itself and ruinous to its constructors; and, entertaining that view, I will no longer permit it to be said that by abstaining from expressing myself fully on the subject I am tacitly allowing capitalists to throw away their money on what my knowledge assures me to be an unwise and unremunerative speculation."

CAPTAIN BLAKELY AND THE WAR DEPARTMENT.

In a second edition of the pamphlet to which we made reference at p. 60 of our Number for July the 17th, Captain Blakely publishes a highly interesting narrative of the transactions which have taken place between the War Department and himself, in reference to his improved cannon. As the relations in which the Government Departments stand to inventors in this country is a subject of daily increasing importance, and one which must before long occupy the attention of the Legislature, we shall lay the facts of the present case, as related by Captain Blakely, before our readers.

The method of making cannon advocated by Captain Blakely is that of casting a tube resembling a gun, but tapering slightly from the trunnions to the breech, the thickest part being at the trunnions, and forcing over it a tube of either cast or wrought iron accurately turned inside. This can be done with a hydraulic press, or by other suitable means. If this second tube be of wrought iron it will be advantageous to make it in several parts, to be fitted end to end, but NOT welded. These parts can be forced on the inner tube one after the other. Over the second tube a third can be forced, and for very large guns a fourth, and even fifth. Great strength will be required, however, only at the breech. The amount of initial extension of the tubes can, by the above means, be accurately adjusted. Captain Blakely prefers wrought iron for all the tubes but the inner one; but to this the Ordnance Select Committee objected in June, 1855, stating, "that cast and wrought iron have different expansive powers," and cannot, therefore, be made to work together with safety. So fatal did that body think this objection, that it expressed its desire not to be troubled with any further experiments, thinking they must fail. However, when the sealing of Captain Blakely's patent permitted him to explain his views more fully, he was permitted to send a 9-pounder gun for proof. This gun was fired against a cast-iron service-gun, and showed an immense superiority; standing (after many rounds with smaller charges) 318 rounds with 6 lbs. of powder and 2 shot without material injury, whereas 110 rounds with the same charge burst the cast-iron gun. So little had this proof strained the gun, that it was afterwards loaded to the muzzle, and fired 158 times before it burst. Seeing this success, the Select Committee recommended the manufacture of an 8-inch gun

on the plan, and both that and a 10-inch gun have been made at Woolwich Arsenal, and are now under trial.

Finding his plans thus in a fair way of being adopted, and believing that he could not much hasten so desirable a consummation by any effort, the inventor meant to let things take their course; but, the Select Committee having reported that to him was due the credit of bringing to the notice of Government a valuable invention, he thought an acknowledgment of this from the Minister for War might facilitate his employment on the staff of the army. He therefore begged Lord Panmure to call upon the Select Committee for a report of their opinion of his invention, and, if that were favourable, to forward his wishes by communicating it to His Royal Highness the Commander-in-Chief. The following is the report of the Ordnance Select Committee, which will doubtless be read with all the curiosity which a scientific document emanating from such a body ought to command:—

January 15, 1858.

"The Committee begs leave to make the following statement relative to Captain Blakely's claim to being regarded the first who has called attention to an important principle in the construction of guns.

"There are many examples of compound guns of ancient date still in existence: indeed, this appears to have been the original system pursued in making ordnance. None is, however, known to the Committee precisely answering to the conditions described as a cast-iron cylinder or bore having wrought-iron rings upon it.

"In the 'Aide-Mémoire' of General Gattendi, as quoted by M. Thierry in 1834, it is stated that in 1813 a company at Lyons proposed to make wrought-iron cannon, and that they made an 8-pounder field-piece, the construction of which is thus described:—On a tube formed as a cannon, successive bands of iron embracing the tube were soldered,* one above the other, until a sufficient thickness, &c.

"M. Thierry himself then proposes the trial of a cast-iron cannon with an envelope of wrought iron adjusting it to the resistance of the gun, and preserving it during explosions from danger of bursting.

"About the year 1834, Colonel Frederix, of Liège, proposed the strengthening of an 18-inch mortar, similar to that used at Antwerp, by adding wrought-iron rings.

"This was done, and the mortar was tried at Bruschaet. It is now in the Musée d'Artillerie at Antwerp.

"In 1840, the proposition of Colonel Frederix to fire 28-pounder guns of cast iron, one having wrought-iron rings on it from the breech to the trunnion, was carried out.† A drawing of this, and a memorandum, was kindly furnished to the Superintendent, Royal Gun Factories, by Colonel Frederix in 1855, and the former, with a translation of the latter, is appended to the Report.

"This gun was in the Great Exhibition of 1851, and is still in existence.

"In 1845, Professor Treadwell, of the United States, called attention to the comparative resisting powers of wrought and

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* "How can the Committee," asks Captain Blakely, "think that *soldering* bands of iron on a tube will distribute the strain equally? On receipt of their report I consulted Sir Charles Fox as to whether he saw any similarity between this plan and mine. His reply was, that merely soldering on bands would not give nearly so much additional strength as my plan of *forcing* on the outer tubes. This *force* (or its equivalent) Sir Charles considers *essential*. I also consulted Mr. James Longridge, a civil engineer well known for his mathematical attainments. He replied, that there is a '*most essential difference* between soldering one tube on another, and contracting it on.' The latter method has the same effect as using force, but is not under such perfect control. Re-assured by the replies of these gentlemen, I inquired further into the doings of the Lyons Company, and found that *their mode of construction not only did not equalise the strain, but absolutely paralyzed the outer portions more than the usual method.* They formed the inner tube of bars of iron welded longitudinally, therefore incapable of stretching circumferentially more than *half as much* as if the so-called fibre were in the transverse direction. The outer tubes they made with the fibre round them, therefore incapable of exerting their power without being stretched to an amount which must have not merely cracked the inner tube, but opened *large* fissures in it! The same plan was adopted by the Mersey Steel Company for the 13-inch gun so patriotically presented by them to the country, except that they welded, not soldered, the parts together. As a triumph of mechanical power this piece of wrought iron stands unrivalled—as a gun it is subject to the above objections, *fissures having already appeared* in the inner tube."

† "The plans of M. Thierry and Colonel Frederix seem identical. They would have an advantage over cast-iron guns, because, as we have seen, the outside may extend about one-tenth as much as the inside. Now, if the outside be of cast iron, it can only exert a force of half a ton per square inch when the inside is fully strained (5 tons per inch), but if it be of wrought iron the same extension will accompany an exertion of power of nearly one ton per inch. This is an improvement certainly, but so slight as to be too dearly bought at the trouble and expense of a quantity of extra turning and other work. By *forcing* on the outer tube, originally smaller than the outside of the inner one by the requisite amount, we can without difficulty make the wrought iron do six or seven times as much work as M. Thierry did. It is really surprising that the Select Committee should refer to inventions a quarter of a century old, as it is well known that the action of iron under strain was not investigated so long ago. In their own report, indeed, they *acknowledge that the theoretical considerations connected with this subject were first placed before them, in a tolerably complete form, by myself in* 1855; they further acknowledge that the same calculations were imported as a great novelty from America in 1856! These calculations, like those of Professor Barlow, refer to the evil, not the remedy for it, which I firmly believe I was the first to publish."—*Captain Blakely.*

cast iron. The pamphlet was translated into French in Paris in 1848, and is in possession of the Committee. He proposes a gun built of several rings or muffs of wrought iron, joined end to end* by welding. Each muff is composed of others placed concentrical and welded one on the other—or he makes each of thin steel—or he takes a bar of iron wound spirally round as a ribbon.

"The gun so made is at Vincennes.

"In 1851, Mr. Bodman† called attention (*sic*) of the authorities in America to the theoretical considerations connected with cast iron in a state of various tension, and on the theory then advanced (similar to that now brought forward by Captain Blakely) he was permitted to alter the system of casting iron ordnance for experiment.

"This paper was not known in this country until 1856, but the results were well known to the Committee on Machinery which visited the United States in 1854.

"In 1852 Mr. Daniels proposed to the Committee to place steel rings on old guns.

"In 1854 Mr. Dundas filed a provisional specification for forming a gun by shrinking wrought-iron hoops or cylinders expanded by heat on to staves kept cool by artificial means.‡

"In 1855 Captain Blakely has a provisional specification indicating a system of forming guns of an internal tube or cylinder, having collars or rings *driven on*, the interior being shrunk for the time by the application of cold.

"The strengthening of old guns is here proposed to be done by '*driving on*' rings, or by the use of coils of wire.

"On the 23rd August his specification contains the first allusion to rings heated and shrunk on,* and then incidentally.

"On the 15th April, 1855, an order was given by Lord Panmure to issue a 9-pounder gun to Captain Addison, who proposed to strengthen it by shrinking on wrought-iron rings.

"On the 25th April, 1855, the Ordnance Select Committee was directed to place itself in communication with Captain Blakely, relative to the fabrication of guns on his principle (vide patent).

"29th April, 1855, Lord Panmure ordered the Committee to receive Professor Treadwell, of the United States, who appeared to have made some calculations relative to cast and wrought iron in the form of cannon.

"25th May, 1855, an 18-pounder gun prepared on Captain Blakely's principle (not rings on an old gun) was ordered for proof, and failed.

"13th June, 1855, Captain Blakely brought forward certain calculations relative to the construction of guns.

"21st July, 1855, Captain Blakely ascertains that a gun is being prepared for Mr. Waygood (or Captain Addison), by shrinking hoops on it. An arrangement is made between Mr. Waygood and Captain Blakely, but the former subsequently declares that Captain Blakely has 'stolen a march on him'† by his representations.

"The application of wrought-iron rings to cast-iron cylinders has been in use for hydraulic presses.‡

"Sir Thomas Maitland states it was applied to the muzzle of a gun or guns in the first Chinese war of 1842. It was also

* "By these means," says Captain Blakely, "as perfect a wrought-iron gun was obtained as could be made of a welded mass, but the strain was distributed exactly as in a cast gun. *The learned Professor has given up this plan and now advocates the same principle of construction as I do.* In 1856 he read a paper on the subject to the American Academy, of which he is Vice-President. *Surely a paper from such a person to such a body is strong proof of the novelty and value of the principle explained.*"

† "Mr. Bodman perceived the defect of ordinary cast guns being subject to undue strain in the inside, but the remedy he suggests is totally different from that I wish to see adopted."—*Captain Blakely.*

‡ "The inferiority of this mode of construction to mine, or even to the ordinary method of casting, was proved at Shoeburyness by experiment. One of Mr. Dundas's guns was fired against one of mine and a cast-iron gun. After about 120 rounds from each gun with smaller charges, Mr. Dundas's was fired with 6lbs. of powder and 2 shot *three times and burst;* the cast gun was fired 110 times with the same charge before bursting, and mine was fired 318 times, and even then was so little injured that it was afterwards loaded to the muzzle, and fired 158 times in that state before it burst. As the most candid of us are bad judges in our own cases, I wrote to Dr. Hart, to ask if he saw any similarity between Mr. Dundas's plan and mine. He says he planned a gun similar to mine, *to avoid the defects* of such a gun as Mr. Dundas's, as well as those of a cast gun. To suppose that I was ignorant of the mode of making the old bombards, is not flattering; nor can I take it as a compliment if the Committee mean that they think I wish to be considered the inventor of that mode. To prevent another charge of the kind, I may as well mention that I do not claim the use of gunpowder as a novel feature of my plan."—*Captain Blakely.*

* "The Select Committee seems to prefer shrinking on the outer tubes to driving them on. After many trials I cannot agree with them or look upon the shrinking method as any but a makeshift—so uncertain is the amount of contraction in cooling metal."—*Captain Blakely.*

† "I have a letter from Mr. Needham, late managing partner of the Butterley Company, bearing testimony that they had made or were making a gun for me before I heard of Mr. Waygood. Sir Charles Fox's letter also proves that I had worked out the idea long before July, 1855, when I communicated with Mr. Waygood solely from a good-natured wish to save him from spending money on a plan so like what I had patented."—*Captain Blakely.*

‡ Metal screws have long been used to draw corks, still the application of similar instruments to propel vessels was considered a valuable invention.

done in the earliest war in Spain and in the Crimea.*

"The Committee are of opinion that to Captain Blakely is due so much of the credit of directing attention to the theoretical considerations connected with this subject, that he first placed them before the Committee in a tolerably complete form.

"As regards any reward or recommendation for the particular guns made by him at his own expense and according to his patent, the Committee cannot see that he has any more claim than any inventor who has only partially carried his ideas to success; but it must be clear that these ideas at that time were very indefinite, and the guns were a complete and utter failure† in consequence.

"The only valuable result likely to follow at present from such a theory is one which had already been partially experimented on and practised—viz., wrought-iron hoops on cast-iron cylinders or guns.‡

"The Committee believe it is generally acknowledged that up to a 68-pounder gun of 8″ bore (to say the least) cast iron furnishes an excellent material, and that the application of rings to larger bores for round shot may eventually be desired, as has already been proved in the case of the muzzles of the Lancaster-bored guns."

This Report was construed by Lord Panmure as meaning that the Select Committee knew the value of Captain Blakely's method of constructing cannon long before he brought it to their notice. He himself so construed it at first, believing that some new member of the Committee had drawn it up without investigating the nature of his invention. This seemed the more likely as there is no similarity between his plan and some of those mentioned in the Report. Two of the latter, indeed, would, if carried out, have, as he remarks, an effect *exactly the reverse* of that which he advocates; they would, so far from distributing the strain more equally, distribute it much more unequally, than the ordinary method of casting. It is found, however, that the same Sub-Committee, with the same president, Col. Eardley Wilmott, made this Report which had in June, 1855, reported the plans dangerous and impracticable, and in December, 1856, after the successful experiment, acknowledged that he "had the credit of having brought it more particularly to the notice of Her Majesty's Government." The Report of Jan. 15th, 1858, must therefore mean simply that the Sub-Committee does not even now expect much from the invention, because other plans, in its opinion similar, have failed. The same Sub-Committee may, as soon as further experiments have established the principle, acknowledge their mistake "with the frankness to be expected from a party of gentlemen," as Captain Blakely remarks.

Meanwhile he has been obliged to defend himself against the imputation, contained in the letter from the War Office, that he has claimed the discovery of an invention which has long been known, and he appeals for a fair judgment to his brother Artillery Officers.

We shall return to this subject, and complete the statements connected with it, in our next.

* "The muzzle of a gun was broken in the Crimea and fastened on with a band of iron. Is it possible to argue that, *therefore*, there is no novelty in my plan of distributing the strain throughout the thickness of a gun? The writer of this paragraph of the report must have thought that I claimed the discovery of iron."—*Captain Blakely.*

† "The Committee calls my gun 'a complete and utter failure.' I beg to refer the reader to Captain Caffin's report, where he will find proof that I made probably the strongest gun that has ever existed. My ideas are said to have been indefinite 'at that time.' No period is mentioned, but I took my patent on the 27th of February, 1855: the law allows six months for bringing indefinite ideas to a practical form—in August the gun was at Woolwich, and Sir Charles Fox's letter and Mr. Needham's prove that my ideas were tolerably definite even in March, 1855."—*Captain Blakely.*

‡ Wrought-iron rings on cast-iron cylinders or guns are in this report called "a valuable result." In June, 1855, the same Committee reported that guns on this construction could never be considered safe. To whom do the Committee consider their change of mind due? "Had the success of my gun nothing to do with this?" asks Captain Blakely. "In the spring of 1856, Colonel Wilmott, *at the country's expense*, tried experiments with hoops of iron round split 13-inch mortars! I have been positively assured that this is a fact, and have no doubt it is so. When directed by the Committee to make a compound 10-inch gun, he made it almost exactly on the model of my 9-pounder, which had borne such an extraordinary test. A letter which appeared in the *Mechanics' Magazine* (Nov. 21, 1857) proves that a perseverance in mystery provokes injurious suspicions. Although not signed, the writer's name and respectability must be known to the Editors. He says, 'Very possibly his (Mr. Longridge's) wiring a cast-iron tube gave the idea of casting brass or gun metal on a cast-iron tube for the same object, as there are guns now making at Woolwich as the invention of the *chairman* of the Select Committee, which I have seen lately, of this description.'"

A New Corps of Military Mechanics.—The Secretary of War and the authorities at head-quarters having judged it expedient to establish a more perfect system of obtaining qualified armourer sergeants, for service in regiments, battalions, and corps of the regular army and regiments of embodied militia, a Royal warrant has just been issued by the Secretary of War by which it is ordered, that all armourers intended for service in the regular army and regiments of embodied militia shall be enlisted and formed into a corps to be called "The Corps of Armourer Sergeants," which corps is to be attached to the Royal Small Arms Factory at Millbank. The men so enlisted are, according to the Royal warrant, to be governed by various rules which are particularized in the warrant.

LAYING DOWN DEEP-SEA TELEGRAPH CABLES.

Drawings of a design, and models of working gear, for safely submerging ocean telegraph cables, the invention of Mr. Charles Hoare, of Billiter-square, are now exciting considerable attention at the Royal Institution, the Institution of Civil Engineers, the Royal Geographical Society, and the United Service Institution, and are considered by many to offer a satisfactory method of laying heavy deep-sea cables. The difficulties of the undertaking are fairly estimated by Mr. Hoare, and those interested are invited to examine the suggestions for their removal, which he considers easily capable of practical and successful application. Several years have elapsed since Mr. Hoare first made his suggestions to the Government, urging the advantages of telegraphic communication with India and America. The following will furnish an idea of the appliances and operations recommended by him.

Mr. Hoare's method consists essentially in laying the cable by the following process:—The centre splice being made in mid-ocean, an inflated buoy is attached, and cast off, and the paying-out ships proceed upon their opposite courses. Three miles having been paid out, and buoyed at every half-mile, signal is made for steam tenders to detach or destroy two or three buoys right and left of the centre, when the cable will descend, carrying the neighbouring buoys down below the surface in succession. As the paying out is continued additional buoys are attached to the cable at half-mile distances.

"At a certain depth," says Mr. Hoare, "owing to the density of the water, the air in the buoys is *displaced*, and, their duty being thrown upon those above them, all are in turn submerged, and in turn exhausted. From the nature of the descent, the possibility of the cable twisting, or festooning, is prevented; neither can it be *dragged* across any submarine ridge, but it is permitted to adapt itself to the outline of the ocean bed, whether rugged or plain."

The following is a description, by the inventor, of some of the details connected with his plan.

"*Buoys.*—These are made of flexible materials, for the sake of portability, fitted with ring, straps, clasp, and nozzle; they can be *instantly* inflated by an air cylinder of 2 or 3 atmospheric pressures, supplied by the ships' engines; their capacity is adapted to the weight of the cable, one being used for every half-mile *throughout*; they are of course lost, but the expense incurred is amply covered by the saving and *safety* of the entire cable, as they form a part of the preventive gear in case of breakage; the whole being so arranged as to permit of their being rigged and attached while the cable is being paid out freely.

"*Preventive Gear.*—This most important part of the invention renders the breaking of the cable a comparatively unimportant matter, as the end can with little difficulty be recovered and re-spliced; two reels with wire rope are worked by a steam-band; before starting a buoy, one end of the preventive line is to be rove through the buoy-ring, and then fastened in-board; the strain of the cable carries it off the reel at an equal rate, and when run out it *detaches itself*, and the other end is hitched on, and the line wound home; but the buoy is *never released* until another is securely rigged, attached, and cast off; so that the cable itself, though it might break, is always under the check and control of those in charge; the time, friction, power, &c., of reeling in are well compensated by the safety and success of the expedition.

"*Stern Lift.*—This constant source of danger in the late experiments is *entirely removed* by the system of buoying; for the weight and strain of the length of cable *in suspension*, instead of being *concentrated* on the point of departure from the vessel, are divided over as many points as there are buoys in effective action, whether on the surface or submerged; and the sudden lift of the ship will therefore affect only that portion of the cable between the vessel and the *nearest buoy*; the additional strain will be inconsiderable, when the immense reduction and the strength of the cable are considered, the maximum scarcely reaching 12 cwt., instead of 30 or 40 as recorded."

The plan is illustrated in last week's *Illustrated London News*, to which reference may be made by those who have difficulty in comprehending Mr. Hoare's proposals.

A New Breech-Loading Rifle.—A new species of breech-loading Minié rifle musket, an American invention, was on Saturday received at Woolwich for the inspection and approval of the select committee of the Arsenal. The calibre and weight are similar to the ordinary muskets at present in use in our service. No derangement of the barrel is required in loading, the cartridge being applied through the medium of a small piece of mechanism, resembling a trap, over the lock. The cartridge bags are of metal, nicely fitting the chamber, and plugged with india rubber, the centre of the plug containing the percussion cap, and the charge is guaranteed by the inventor to be secured from injury when exposed to any moisture, even under water. On preparing to reload the action of raising the small cover at the breech withdraws the empty cartridge case, which is liable to the same amount of wear as the gun itself.

TELEGRAPHS TO INDIA.

NOTWITHSTANDING the hopes which the Government hold out to the promoters of the Great Indian Submarine Telegraph Company, it appears that an agreement has been entered into between the Lords of the Treasury and the Red Sea Company, for the construction of a line of telegraph from Alexandria to Kurrachee, by the Red Sea and Aden. The terms of the agreement are to the effect that a capital not exceeding £800,000 shall be raised, of which 5 per cent. of the whole amount subscribed must be paid up forthwith. The Treasury are to guarantee a rate of interest on the amount of capital paid up from time to time of 4½ per cent. per annum, payable half-yearly, for the term of fifty years certain. The portion of the line between Alexandria and Aden is to be immediately commenced through the agency of contractors of the largest experience in telegraphic operations, who are to lay the line and transfer it to the Company in an efficient state on their own responsibility. The Company is to work the line of telegraph and keep proper accounts. The surplus receipts, after paying working expenses, are to be applied in relief of the Government guarantee. In case the surplus receipts should exceed the guarantee, one-third of such surplus is to be appropriated to the repayment of any advance of interest made by the Government to the Company; one-third is to be applied towards forming a reserve fund, which is not to exceed £80,000; and the remaining third is to go towards increasing the dividend of the shareholders, up to 10 per cent. per annum. Should there be no debt due to the Government for advances, and no deficiency in the reserve fund of £80,000, the whole of the profits are to be applied for the purpose of making up a dividend at the rate of 10 per cent. per annum. All surplus and unappropriated profits beyond 10 per cent. per annum are to be applied in reduction of the tariff, or to some other purpose at the discretion of the Government.

The reserve fund, the surplus, and unemployed capital are to be applicable to the maintenance or restoration of the cable, and to make good any deficiency in receipts to cover the working expenses, should such a contingency arise, so that the Government guarantee of 4½ per cent. shall be the *minimum* rate of dividend. All Government messages, subject to the terms of the concessions from the Turkish Government, are to have priority over private messages, but will be paid for at the same rate. Two ex-officio directors are to be appointed to the Board, without whose sanction and concurrence no contracts or other proceedings of the Company will be valid.

In case of default by the Company in completing or reinstating the line, or working it efficiently, the directors of the Company are to give up the line to the Lords of the Treasury, on the latter paying off the capital paid up, with interest at 4½ per cent. per annum from the date of the last dividend.

This Company, which was originally formed for the purpose of establishing telegraphic communication between England and India by the Red Sea, under concessions granted by the Turkish and Egyptian Governments, will now be enabled, by means of the Government guarantee, to proceed without further delay, particularly as it appears from an official report to the Admiralty that no place can be better adapted for laying a telegraphic cable than the Red Sea. Arrangements for the establishment of a telegraph between Europe and Alexandria have been completed, and the line is to be laid this autumn, by Messrs. Newall and Co.

From information which has reached us, and which was strengthened by remarks made during the brief debate on Telegraphs to India in the House of Lords a few evenings since, it appears highly probable that the Government will not confine their patronage to a single line of telegraph to India, but will, during the recess, facilitate the carrying out of the proposed submarine telegraph.

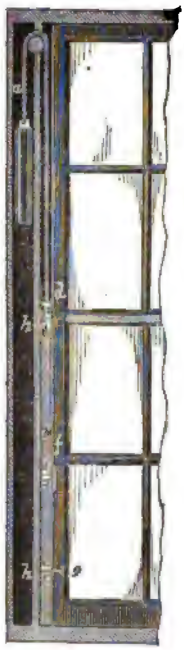
SHAW'S IMPROVEMENTS IN WINDOWS.

MR. SHAW, builder, of Wellington, Salop, has patented a method of fixing a window upon an axis or upon centres in such a manner that the window, on being made to perform a semi-revolution, will present to the inside of the room the side which was previously outside. By this method great facility is afforded for cleaning and repairing. Fig. 1 of the accompanying engravings represents in elevation (partly in section) a part of a window constructed according to this invention; and fig. 2 represents a section of the same. The sash cords, *a*, are attached to loose strips, *b*, which slide in the recesses, *c*, in the window frame. The sashes, *d*, have on either side a projecting pin or centre, *e*, as seen in fig. 1 in the lower sash only. The said centres, *e*, are situated nearly midway between the top and bottom of the sash; the pins or centres, *e*, engage in bearings,

f, in the loose pieces or strips, *b*. Mr. Shaw prefers to place the centres a little lower than the middle of the sash, so that when the sash is reversed it shall have no tendency to return of itself. In order to preserve the sashes in a vertical position, screws, *g*, are passed through the sash stile, and made to engage in the pieces, *h*, fixed in the strips, *b*. The sash thus forms virtually one piece with the loose strips, *b*, and may be raised and lowered as an ordinary sash. On withdrawing the screws, *g*,

Fig. 2.

Fig. 1.



the sash, *d*, may be turned upon the centres or pins, *e*, as will be understood by reference to fig. 2. The sashes, *d*, when restored to their vertical position, are fixed in their places by the screws, *g*. By making the screws, *g*, enter the window stile in an oblique direction, the said screws can be inserted and removed more conveniently than if they were parallel to the window, and without risk of breaking the window.

Geological Drainage.—The system of drainage advocated by Mr. R. Jex Crickmer, in our last Number, has been submitted to the Metropolitan Board of Works, a majority of whom have resolved to take it into consideration. Mr. Crickmer offers his patent to the Board for £200 a-year for life. Mr. Crickmer's address is 101, Borough-road, Southwark, not Bermondsey, as was given in our last.

HIPKISS AND OLSEN'S PATENT MODE OF LUBRICATING SHAFTS.

Messrs. Hipkiss and Olsen, of Birmingham, have patented a mode of lubricating shafts, axles, &c., which is illustrated in the accompanying engravings. Fig. 1 represents in plan, and fig. 2 in vertical section, a journal or bearing for a shaft. They form in the journal a series of holes or recesses, which they fill up with pieces of wood, *a*, *a*. They make a hole, *b*, on the top or on the side of the journal, which

Fig. 1.

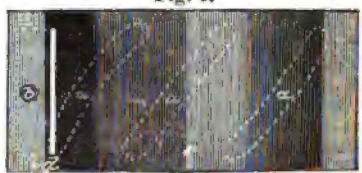
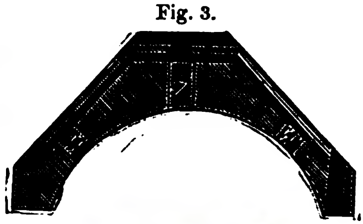


Fig. 2.

hole opens on the working surface at *c*. Oil is supplied at the opening, *b*, and passes out at *c* to the working surface. Particles of dirt contained in the oil are retained on the inclined bottom of the opening, *b*, which bottom may be cleaned

Fig. 3.



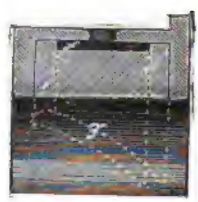


Fig. 4.

from time to time at the hole, *d*. The oil carried from *c* by the revolving shaft is absorbed by the pieces of wood, *a*, *a*, which, becoming thoroughly impregnated

with oil, effectually maintain the lubrication of the shaft, although oil may be supplied at *b* irregularly. They sometimes drill cylindrical holes in the bearing, and insert therein cylindrical pieces of wood.

They construct the upper journal in the manner represented in figs. 3 and 4; that is to say, they make a cavity, *f*, into which the upper ends of the pieces of wood, *g*, open. The cavity, *f*, is filled with oil, with which the pieces of wood, *g*, become thoroughly impregnated, and which lubricates the shaft or axle. Or they make the upper journal without the cavity, *f*, and supply oil through a hole drilled from the outer to the working surface of the bearing.

They sometimes make the lower journal, figs. 1 and 2, hollow, the pieces of wood inserted in the journal opening into the cavity. They fill the cavity with oil, which is absorbed by the wood and lubricates the shaft.

THE IRON ORDNANCE FACTORY AT WOOLWICH.

THE following Return, relating to one branch of a Public Department which most persons are beginning to look upon with great suspicion, will be read with interest.

Return of the Total Expenditure upon the Establishment at Woolwich for the Manufacture of Iron Ordnance, from the 1st day of January, 1854, to the 31st day of March, 1858, separately specified under the following Heads, viz., Buildings, Machinery, Stores of all kinds, Salaries, Wages, and Miscellaneous Expenses, for each year.

PERIOD.	Buildings.	Machinery.	Stores.	Salaries.*	Wages.	Miscel. Expen.	TOTAL.
	£ s. d.	£ s. d.	£ s. d		£ s. d	£ s. d	£ s. d
1 Jan., 1854, to 31 Mar., 1854	...	...	...	...	...	...	...
1 April, 1854, to 31 Mar., 1855	...	...	1,690 3 6	...	...	...	1,690 3 6
1 April, 1855, to 31 Mar., 1856	...	...	5,029 18 5	...	...	...	5,029 18 5
1 April, 1856, to 31 Mar., 1857	59,927 4 7	2,608 14 3	4,419 19 0	...	...	...	66,955 17 10
1 April, 1857, to 31 Mar., 1858	780 0 0	34,891 9 8	13,210 15 9	...	1,313 6 3	6,188 1 9	56,383 13 5
	60,707 4 7	37,500 3 11	24,350 16 8	...	1,313 6 3	6,188 1 9	130,059 13 2

Return of the Number of Guns and Mortars completed, and also those in Process of Manufacture, up to the 31st March, 1858.

Completed	None.
In process of manufacture . .	10
Vented in the gun-boring mill .	215

Note.—The first casts in the new foundry were made on the 9th February, 1858, which, with others, up to the 31st March, were as trials.

The Woolwich correspondent of the *Times* made the following statement on Tuesday last:—"The difficulties experienced in casting iron ordnance at Woolwich have satisfactorily diminished; nevertheless, it will require many months to complete the undertaking entered into by the establishment to produce the 250 guns promised by the 31st of March. Twelve 68-pounder guns have been at length proved, the whole of which turned out extremely well. From the difficulty of procuring men accustomed to casting iron guns, very few of the hands are in any degree acquainted with the work, and, from the severe discipline of the establishment, the practical knowledge of those few was seldom available. The work is now likely to progress at the rate of about five guns per week. Many bad castings have recently turned out in the brass-foundry. Several 12-pound howitzers have been discovered, after boring and turning, to be unfit for service. These were experimental guns, containing an extra amount of metal in the casting, requiring an additional cutting of two inches. Some of these guns were so full of holes that a stroke of a sledgehammer would have broken them into fragments."

* This heading has been left blank inasmuch as no addition has been made under the head of "Salaries" in consequence of the erection of the new iron gun foundry, and, if that branch ceased, the same superintendence and staff would be required. Such additional expense, however, as has been incurred exclusively for the iron gun foundry has been placed under the head of "Wages."

SUBMARINE CABLES.

GENTLEMEN,—My attention has been called to some very sensible remarks on the defects of submarine cables, by "An Electrician," in your last Number. If he shall prove as capable of remedying defects as of pointing them out, I for one shall welcome his improvements. A cable possessing the qualities which he enumerates would be a boon indeed. Not that I mean to question the possibility of it; I wish, however, that he had enlightened us a little more upon the new patent to which he alludes. I am generally upon the look-out, but have heard nothing of it yet. Two or three important improvements have been vaguely talked about, but nothing definite. My chief object, however, in addressing you is to express my entire concurrence with the qualities enumerated by him as essential requisites for a submarine cable, as well as with the electrical principles developed in the latter part of the communication. It has long been a matter of surprise to me that companies should have so readily invested their capital in schemes based upon principles which are in violation of universally recognized electrical laws. Surely, what is true in one case cannot be false in another; and, whilst in all our electrical arrangements we find increased economy and efficiency accompany diminution of resistance, or in other words increased conducting capacity, I am at a loss to know why that conductor which is to serve as the vehicle of transmission of the electrical current from one station to another, and upon whose capacity to annihilate distance by its conducting power depends the efficient, rapid, and economic working, should be constructed, as is the case with submarine cables, in such a way as to increase and multiply obstacles. I can only account for it upon a simple fact elicited in conversation with a director of a large Company. His remark was: "We commercial men do not pretend to be scientific; we appoint our electrician with full confidence in his capabilities, and we therefore cannot interfere with his decisions, and must stand or fall by him." Unfortunately, some electricians have very little experience as telegraph engineers, and, what is almost as bad, still less as mechanical engineers; and, on the other hand, I am bound to admit that a very large proportion of telegraph engineers are guided more by practice than theory, and are not sound in their electrical principles. Be this as it may, there are certain electrical laws relating to electro-motive force and resistance which are indisputable; and yet we find these totally disregarded in many of the past and present submarine telegraph conductors.

"An Electrician" alludes to two instances; viz., the Atlantic cable, and a cable having an iron wire for its internal conductor. I believe that the electrical staff of the Atlantic Company are by this time pretty well convinced of their errors; and, as they will, I doubt not, after their next failure, which I take for granted, abandon their present cable and get a better one, we shall see whether they will be so headstrong as to maintain the present inadequate dimensions of their conductor, or increase its efficiency by increasing its size.

By the iron wire conductor to which "An Electrician" alludes, I presume that he refers to the one intended to be adopted by the Great Indian line now on the *tapis*, which cable in the present stage of electrical science is certainly a curiosity if not a *lusus scientiæ*.* Your correspondent might have alluded to a most important defect in this iron conductor, and one which will increase with the intensity of the current to be employed. It is the collateral development of magnetism, upon the perfect freedom from which depends much of the conducting efficiency of a wire.

Professor Callan has talked a great deal of nonsense about substituting iron for copper in induction coils, and his own experiments curiously enough disprove all his notions about it. One thing, however, he certainly does prove, viz., that the magnetic character of iron renders it more susceptible to the generation of induced currents within itself, and constructs what he calls an armature capable of giving induced currents, in which he commits the Hibernianism of omitting the armature altogether, and using an iron coil without an armature; but I can hardly bring myself to believe that the patentee of this iron cable is really in earnest, or that the Company are so commercially infatuated, or so electrically uninformed, as to entertain any serious idea of adopting it. A moment's reflection on the difference in the relative conducting powers of iron and copper will show how vastly inferior the former is to the latter, and therefore how much less suited for the office it has to perform. The scheme is a gigantic one, and requires caution in the adventurers, and the soundest experience in the engineers.

I am, Gentlemen, yours, &c.,

A TELEGRAPH ENGINEER.

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* Where did our correspondent learn that the Great Indian Submarine Company proposed using an iron conductor, or an iron conductor only? His informant has deceived him.—EDS. M. M.

WOOLWICH ORDNANCE AFFAIRS.

GENTLEMEN,—There are many ways by which the interest of the public may be benefited by such valuable professional papers as the *Mechanics' Magazine;* and, at the present moment, when England's Government is called upon to improve our naval and military establishments, to meet events which an unfortunate concatenation of causes and effects may sooner or later produce, I feel convinced your readers in general will give you credit for the interest you take, by allowing your columns to be so appropriately employed on the subject.

I am glad to find, by your recent Number, page 56, the Royal Standard Foundry, at Woolwich, is likely to repay the country for the outlay of money in its erection, and I cannot see why, if conducted by experienced men mechanically acquainted with the casting of ordnance, the requirements of the service should not be obtained; but it must not be defeated by political or other blighting patronage, or by the presumption of gentlemen whose professional services may be more fittingly employed.

I make these remarks with the best of motives, having been a personal witness to the ruinous consequences resulting from not appointing "the right man in the right place" in our public establishments, and from a clear conviction that we can no longer submit to such party sacrifices with impunity. By the perfection of the Royal Standard Foundry, the War Department will have the power at hand of casting ordnance, for experiment, directly under its immediate notice, and thus give an impulse to improvement of which it has not been before in possession; and, if the forging be also carried to perfection, we shall be indebted to the late Government for an undertaking of more real importance to the State than a cursory observer may perceive.

That we are nationally called upon to render the sister services adequate to sustain in the best possible way the honour and independence of which we have a right to be proud, we all more or less profess; and, if there be those among us who do not see the necessity for being prepared *most efficiently*, let them ask for what those extensive preparations for war are now being made in every quarter?

France, Russia, and America have all resolved to have formidable navies, and so let them; but France, be it remembered, has the most formidable within a few miles of our shores, and Cherbourg was selected as the most fitting position for that navy before Napoleon the First determined to make it what it now is; and his successor, now on terms of professed friendship with this country, pushes forward that great national undertaking as if the very existence of France as a nation was solely dependent upon it. If he thinks so, we cannot blame him, but we are bound to be prepared for the worst, and have no desire to give offence in being so prepared.

The War Department has shown a desire to improve our ordnance, and, partial or otherwise as may have been the course adopted, it has paved the way for more favourable examples than those produced; but who is really to be blamed for the expensive abortions now so generally known and complained of, the country at present is not likely to know.

One thing is very evident, Lord Panmure gave his personal attention to Woolwich improvement, for which he deserves the thanks of the country; and, if General Peel, his successor as Minister of War, has not as yet shown the same zeal, by personally inspecting the Royal Arsenal in the same way, as stated by the *Times,* let us hope that he is guided by circumstances which will show in due time that he has not neglected to discharge his duty, as some are inclined to believe.

I am, Gentlemen, yours, &c.,
OBSERVER.

July 19, 1858.

[General Peel has spent three hours at Woolwich Arsenal since this letter was received.—EDS. M. M.]

THE INVENTION OF ROLLING IRON.

GENTLEMEN,—I omitted to suggest in my letter given in your last Number, that it might save the time and credit of any writer on "Iron Bridges," or others, from falling into a similar mistake as to the unexampled patents of the late Henry Cort, for puddling, balling, and rolling iron, if they would first examine faithfully the abridgments of the specifications published by the Commissioners of Patents in three series—No. 1 relating to the manufacture of iron and steel, comprising all expired patents from 1621 to 1857; No. 2, Patents granted under the old law; No. 3, Patents under the new law, including more than 500 abbreviated specifications for 5s.

On reference to No. 1 series will be found, at p. 4, a short *abstract* of the specification of a patent in 1728, fifty-five years before H. Cort's, granted to John Payne for his invention of a method by which pig or sow iron was melted "with divers ingredients, wood ashes, glass, salt, &c., and brought into a state of malleability; it was then drawn into bars under the forge

hammer, the bars being afterwards heated in a long hot arch or cavern, and drawn through two large *metall rowlers*, having proper notches and furrows on their surface."

It may save others trouble if I anticipate a reference to this Patent, the only one for 200 years that ever approximated in the most distant degree to Henry Cort's grooved rollers patented in 1783. That it must have proved like one of the "baffled speculations" alluded to by Mr. Harry Scrivenor, in his History of the Iron Trade, good for nothing in the great work of rendering the British nation independent of foreign countries for bar iron, seems to be shown by the fact that more than half a century was suffered to elapse without making a single pound of rolled bar iron sufficiently unexceptionable in *quality* to supersede foreign iron, *before* Henry Cort made it under his patents in 1783-4, and proved it in all the Royal Dockyards superior to the best Swedish iron for naval use. Besides, previous to 1782, the *import* of foreign bar iron was 70,000 tons annually, averaging, with duty, nearly 40*l.* per ton; now, the export exceeds the import more than ten times over, annually, as shown in my last.

Let any one compare the specifications of John Payne in 1728 with those of Henry Cort in 1783-4, and they will cease to wonder at the total failure of the former, and the unexampled success of the latter for seventy years, in this and all other nations making iron, the inventions of puddling, balling, and rolling never having been once attempted by John Payne, as patented by Henry Cort.

In Payne's specifications for "*mettall rowlers*" there is not the slightest reference to the use of "*collars*," so particularly described by Henry Cort; the latter states at p. 6 of his specifications in 1783, speaking of the balling, piling, and rolling process, "In the case of thick bars or squares, or round bolts, they are welded through the rollers; grooves of the shape and dimensions required are made in the under roller, and collars in the upper roller to work exactly within such grooves, the surface of such *collars* being either plane for squares and flats, or concave for bolts, and the like, as the case may require."

In Mr. Truran's work a complete drawing is given of the *grooved rollers*, as now in operation at the Cyfartha, Dowlais, and other ironworks, shows that they exactly correspond with Henry Cort's specification in 1783. They were copied from his own plans by Mr. James Cockshutt, and erected by him at Cyfartha, under the superintendence of Henry Cort, in 1789, Mr. Cockshutt being at this time in partnership with the late Mr. R. Crawshay. The latter was so convinced of the value of the rollers that he agreed to pay 10s. per ton royalty for the use of them till the patent expired in 1798; *but, although not a farthing was ever paid*, Mr. Crawshay states in his letter to the secretary of Lord Sheffield, in 1808, that "he took the plan from a Mr. Cort, who had a little mill at Fontley (in Hampshire), and that he, Mr. Richard Crawshay, was then making 10,000 tons of rolled iron annually."

I am, Gentlemen, yours, &c.,
RICHARD CORT.

9, Hemingford-terrace,
Caledonian-road, Islington,
August 4, 1858.

DIE-SINKING.

GENTLEMEN,—I believe that die-sinking as at present practised is a work entirely of hand, requiring great artistic skill, and being consequently a most expensive process. I think it might be done much more readily by means of electricity.

Take as an example a pair of dies for casting metal buttons; let a model in wax be made with the face of the button standing out in relief on a flat surface of, say, an inch all round its edge. The face of the model must now have a conducting surface imparted to it, either by black lead or the phosphorus and gold solutions; then place it in an electrotyping apparatus for receiving a coating of iron. When this is of tolerable thickness (say $\frac{1}{16}$ in.), a piece of iron of the same diameter as the model, and, perhaps, half an inch thick, is to be covered with wax on the back and circumference, and placed with the face (perfectly free from grease or dirt) opposite to the model, and touching the iron on its surface; the deposited metal will now be thrown down between the two, and if the strength of the battery be carefully regulated they will be united into one solid piece. All the wax may now be removed, and the edges trimmed with a file. We here have one of the dies in which to cast the button; the other may be made in the same manner.

This method is applicable to the making of dies for casting all kinds of ornaments in soft metal, such as teapot knobs, handles and feet of cruet frames, &c., dies for stamping soft material, as leather shot-pouches, bookbinders' work, &c. As the temper of the metal deposited depends entirely upon the intensity of the battery current, I have no doubt that, if that were carefully regulated, dies might be made fit for stamping Britannia metal or copper.

The great recommendation of the process is its extreme cheapness.

I am, Gentlemen, yours, &c.,
J. W. KIDD.

Sheffield, August 2nd, 1858.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

NAPIER, J. M. *Improvements in letter-press printing machines.* Dated Dec. 18, 1857. (No. 3113.)

This relates to platten or flat-surface machines—that is, machines in which flat-surface pressure is used to obtain the impression from the form of matter, and especially to that arrangement in which the type tables have a horizontal motion imparted to them after the impression is taken; and the invention consists in an arrangement by which the times of rest and motion of the frisket frames which carry the sheets can be regulated so as to increase the production of the machine. When two colours are to be printed in register upon the same side of the paper, the patentee employs a machine similar in general to that in common use for printing from two separate forms of matter with one platten, in which the forms pass alternately under the platten, each delivering its impress to a separate sheet of paper; but, instead of using two complete forms and feeding a sheet of paper for every impression, he places the two forms which are to be inked in different colours in the same relative positions as two ordinary forms might be placed in, and so arranges that part of the machinery which supplies the sheets that each sheet is caused to remain under the platten until it has received two impressions, one from each form. The sheet then printed with two colours retires from under the platten, and makes room for the next incoming sheet. If more than two colours are to be printed on each sheet, register points should be used, and the sheets can be passed through the machine again to receive impressions from the other forms, which will occupy the place of those used to print the two first colours.

OXLAND, R. *Improvements in the manufacture of alloys or compounds containing metallic tungsten.* (A communication.) Dated Dec. 18, 1857. (No. 3114.)

This consists in obtaining metallic tungsten by exposing wolfram ore to the strong heat of a furnace, in crucibles lined with charcoal. Also in the use of wolfram in combination with iron for producing cast iron, wrought iron, and steel, and the use of metallic tungsten in combination with other metals in the manufacture of German silver.

LEES, A., and J. CLEGG. *Certain improvements in looms for weaving.* Dated Dec. 19, 1857. (No. 3116.)

This consists in certain combinations of parts whereby the picking sticks are brought into operation when required, which cannot be described without engravings.

HART, T., and A. JONES. *Improvements in looms called dobby looms.* Dated Dec. 19, 1857. (No. 3117.)

This consists in a mode of giving motion to the hooks which operate upon the jacks and healds. Instead of giving the knives or lifters a parallel sliding motion working on rods or slides, the patentees give them a vibrating motion by levers working on fulcrums supported by the framing, thereby accommodating the depth of lift to the distance of the healds from the traverse of the shuttle, the levers and lifters being worked by other beams or levers connected by rods to the ordinary treddles. To bring the knives or lifters completely down so as to clear the hooks, they connect the two vibrating levers by a band and springs. The two pattern cylinders are connected by gearing. Each pattern cylinder is furnished with a ratchet wheel, for giving motion to the cylinders and lattices in opposite directions. The revolving motion is produced by the ratchet wheel coming in contact with a two-ended catch on a stud fixed to the framing, so that when the cylinders slide to and fro part of a revolution is made. One end of a catch is employed for advancing, and the other for reversing the pattern.

FURNIVAL, R. *Certain improvements in machinery or apparatus for cutting paper, cardboard, and other similar articles.* Dated Dec. 19, 1857. (No. 3118.)

This consists in a method of imparting to the cutting knife a reciprocating motion in a horizontal lateral direction across the material to be cut, simultaneously with the descent of the knife, by a vertical eccentric, or vertical heart-shaped shaft, connected with, and actuated by, the shaft employed to cause the descent of the knife.

WALKER, W. *An improved apparatus for the purposes of heating and drying.* Dated Dec. 19, 1857. (No. 3119.)

These consist in constructing an oven under the kiln, within which is a fire-place. Between the fire and the roof of the oven flues or tubes are placed, and through these air is passed from the atmosphere to the drying kiln. To dry with as little fire as possible, if pure air is not required, the fire doors are left open, and the dampers closed, which will allow the air to pass from the oven to the drying kiln.

BROOMAN, R. A. *Improvements in lime kilns, and in apparatuses employed for working the same.* (A communication.) Dated Dec. 19, 1857. (No. 3121.)

The objects here are to facilitate the working of lime kilns, to preserve lime burners from injuries, and to improve the quality of the lime produced; and the invention consists, 1. In constructing and fitting lime kilns in a certain manner. 2. In forming certain apparatuses to be employed for working such kilns. The interior of the kiln is of such a form as an ellipse would generate by moving round its major axis placed in a vertical position, the figure thus generated being truncated at different distances from its centre, and having its larger end uppermost. At the bottom of the kiln is fitted a curved grate with its convex side upward. At the front of this grate is one door or register, and at the front of the pit below this grate another. By opening or closing these a more or less powerful draught may be admitted to the kiln. The recess by which the doors are approached expands outward, concentrating a large current of air upon the entrance to the kiln when one or both is or are open. Rails are laid from beneath the grate through the vaults to the lime store or receptacle, and upon these carriages run for conveying away the burnt lime, &c. In front of the doors is fitted an inclined folding grate, which folds aside when the doors beneath the grate are to be opened, and when they are closed turns down and guides the burnt lime from the kiln to the ground as it is raked through the discharging doors. A carriage is placed beneath the grate to catch the lime dust, ashes, &c., that fall through, and when full is withdrawn and replaced by an empty carriage. A similar carriage is also placed beneath the inclined grate for the same purpose. On each side of the kiln is fitted a double furnace, in which ordinary fuel is burnt to aid the calcination. In front of the furnace a chamber is built to shelter the lime burners. A series of hinged iron screens is fitted at the top of the kiln so that they may be placed over the burning materials, or not, as may be required, to protect them from strong currents of air or otherwise. The apparatuses employed for working lime kilns consist of a pronged fork or rake, a lance-like instrument, a collar or support, which may be adapted to the discharging aperture, and a leg guard or shield composed of rushes, all for the use of the lime burners.

THRIFT, W., and A. HIGH. *An improved self-acting ship's water-closet.* Dated Dec. 21, 1857. (No. 3127.)

For actuating the water supply valve and the escape valve of the soil pan, by the rising and falling of the seat of the closet, on the person sitting or removing therefrom, the patentees employ two levers, the one placed in connexion with the seat of the closet, the other with the arm on the axis of the soil valve, and also with the valve to admit the supply of water. These levers are placed in such

relation to each other that a catch suspended to the end of the first lever (that connected with the seat) when the seat is depressed and the catch raised swings over a stop or catch formed on the valve lever. The catch lever is weighted, so that when the person seated rises the catch descends, and imparts motion to the valve lever, but again releasing itself before it arrives at its lowest position. The valve for the supply of water is placed in a smooth cylinder having a horizontal partition, through which the valve rod passes up to the lever before mentioned. The water valve is placed in the bottom of this small cylinder, and when opened admits the water, which passes from thence by another pipe, and enters the fan or spread of the closet. The water admitted, and, passing through the lower part of the small cylinder, by its pressure raises a small valve in the partition before mentioned, and enters a space between it and an inverted cup leather fixed to the valve rod. The water entering prevents the descent of the valve when the weighted lever falls, the water having no other escape than by a small return passage through the partition, which retards the closing of the valve more or less, and causes it to shut slowly.

Taylor, F. *Improvements in closets or privies.* Dated Dec. 21, 1857. (No. 3131.)

This relates to closets where the soil is dried by heat. The patentee employs a receptacle into which the soil falls, on the top of which there are two valves connected at right angles to each other, and these valves are connected to the lid of the closet, so that one valve closes the receptacle when the lid is open, and the other when the lid is closed. Underneath the bottom of this receptacle there is a gas burner to dry the soil, and at the top there is a pipe to convey away the vapours. The valve which closes the receptacle when the lid is shut is rendered perfectly air-tight by the valve fitting into a groove in which water or mercury is placed. The receptacle can be removed from time to time and emptied, and the contents may be employed for manure or charcoal.

Bousfield, G. T. *Improvements in machinery used in the manufacture of springs, and in the application of springs to carriages.* (A communication.) Dated Dec. 21, 1857. (No. 3132.)

The object here is, 1. To obtain in a volute spring the requisite amount of play in the direction of the endwise strain, with sufficient rigidity to sustain strains transverse thereto, and the invention consists in a double volute spring which has the form of two volutes adjoining each other, and is constructed of a strip of metal coiled spirally, so that the rings of the spirals overlap each other, and form ends or bars which are symmetrical. 2. The formation of volute springs of sheet-steel plates, by coiling the same upon a mandril of suitable form, and the machinery in which this part of the invention is embodied is specially adapted to the manufacture of the double volute spring which constitutes the first part of the invention. The principal operating parts of the machine are a blank former or mandril upon which the spring is coiled, and conical rollers by means of which the spring is borne against and coiled upon the mandril.

Tatlow, J., and H. Hodgkinson. *Improvements in railway brakes, and in apparatuses for connecting shafts or rods for working brakes and signals.* Dated Dec. 21, 1857. (No. 3134.)

Beneath the locomotive or carriage to which brakes are to be applied, the patentees place a transverse shaft, carrying a pinion upon each end, and a worm wheel at the middle. The teeth of the pinions take into teeth on the edge of a vertical bar of iron, capable of rising and falling in a support attached to the frame of the carriage. At the lower end of this bar is a brake block, shoe, or skid, which, as the vertical bar is depressed, comes upon the rail, and receives a portion of the weight of the train. The brake block has also jointed to it the lower end of an inclined rod, the upper end of which is jointed to a lug beneath the carriage at some distance from the transverse shaft. Each brake block is formed with a plain or toothed flanged sole, which may be either in one piece with the block, or screwed or bolted to it. Provision may also be made for passing sand or grit through or under the sole of the brake block when in action. The worm wheel, by which the bars carrying the brake blocks are raised and lowered, is driven by a worm upon a longitudinal shaft beneath the carriage. This longitudinal shaft is connected to the adjacent and similar rod on the next carriage by means of connexions which cannot be described without engravings.

Basford, W. *Improvements in the manufacture of gas, and in retorts and other apparatus to be used therein.* Dated Dec. 21, 1857. (No. 3136.)

This cannot be described without engravings.

Normandy, A. R. Le M. De. *Improvements in apparatus used for distilling sea water on board ships and vessels.* Dated Dec. 21, 1857. (No. 3137.)

These consist in combining with such distilling apparatus a small steam engine and pump, suitable for obtaining and discharging the condensing water into the sea above the water line of the vessel; and the steam for supplying such engine may be conducted to it by the same pipe from the boiler as that used to supply the distilling apparatus, and the steam passing from the steam engine may be conducted into the distilling apparatus to be condensed with that supplied to the refrigerator.

Sturges, R. F. *A new or improved manufacture of rollers or cylinders for printing fabrics.* Dated Dec. 21, 1857. (No. 3138.)

The patentee claims making the said rollers or cylinders by casting a hollow cylinder of cast iron in the interior of a tube of copper or alloy of copper.

Kennard, A. C. *Improvements in trussed iron bridges.* (A communication.) Dated Dec. 22, 1857. (No. 3139.)

The improved bridges cannot be described without engravings. The patentee claims constructing trussed iron bridges with parallel top and bottom rails, and diagonal wrought-iron studs and ties of angular or V form, connected at their bases to the transverse girders as described.

Rodgett, S. and D. *An improved method of coupling and uncoupling railway, tramway, and other carriages, waggons, lorries, trucks, and other vehicles.* Dated Dec. 22, 1857. (No. 3140.)

This invention cannot be described without engravings.

Landou, M. *Improvements in cooking utensils.* Dated Dec. 22, 1857. (No. 3142.)

This consists in the employment of an openwork cage, or a box or case to contain the articles to be cooked; for instance, for eggs it should correspond with the shape of an egg, and provision should be made, by a handle, for readily putting it into and taking it out of the boiler or steamer. This arrangement is variously modified.

Maw, E. *Improvements in ornamenting and strengthening metal tubes and rods with wood, applicable in the manufacture of bedsteads and other articles of furniture and framings, and also in the manufacture of the joints or connexions of the posts and framings of bedsteads and other articles of furniture and frames.* Dated Dec. 22, 1857. (No. 3144.)

Ornamental parts of woodwork are to be in the centre or parts intermediate of the length of a tube, &c. Such woodwork is turned or carved to the form desired, and is placed on the tube, &c., so as to surround it; and in like manner end pieces of wood are placed on the ends of the metal tube, &c. Such parts of wood are combined together by longitudinal bars or pieces of wood, so as to produce longitudinal ribs external of the metal tube or rod.

Bridge, G., and J. Hamer. *A new process or manufacture for converting woven silken fabrics or silk waste into a fibrous material fit for being spun into yarn or thread, or for being mixed with silk, woollen, cotton, or any other material to be spun into yarn or thread, and of improvements in machi-*

nery to be employed in such process or manufacture. Dated Dec. 22, 1857. (No. 3145.)

The object here is effected by the tearing and combing action of pointed teeth or pins projecting from the surface of a revolving cylinder, and operating upon material gradually presented by a feeding apparatus, which, while slowly delivering the same, retains its hold with such tenacity that the portions successively brought forward are, by the action of the teeth, separated and combed out from each other and from the undelivered mass, and eventually re-delivered in the state of open fibre. It is also carded by the same machine.

CROSSLEY, D. J. *Improvements in the manufacture of certain textile fabrics, called pellones, and used for saddle covers, and in the machinery or apparatus employed therein, which improvements are also applicable for weaving other fabrics.* Dated Dec. 23, 1857. (No. 3146.)

This consists in weaving the pellones or saddle covers of an unequal width in the direction of the length. The two outer ends are woven the broadest, and the warp threads are gradually contracted towards the middle of the pellone. This may be effected by the use of a "reed" made of a width at the top to correspond with the width of the widest part of the pellone, and gradually narrowed to the bottom to correspond with the width of the narrowest part of the fabric. This reed is caused to rise and fall once during the weaving of a single pellone, so that the warp threads passing through the dents of such reeds will be gradually contracted and expanded in width as required.

LANDI, T., and C. FALCONIERI. *Improvements for laying subaqueous electrical cables for telegraphic communications.* Dated Dec. 23, 1857. (No. 3147.)

At the stern of the vessel from which the cable is deposited the patentees place a large drum, round which it is passed several times, and to this drum an ordinary centrifugal indicator is atttached. The axis of the indicator is graduated, and a moveable socket sliding on it indicates the velocity with which the cable is delivered. The patentees attach to the cable a number of floats or resisting bodies, such as empty barrels, pieces of cork, or planks of wood, to resist the drag of the cable through the water, and thus to check its velocity. The ropes of the resisters may be made of two pieces connected by a cement solid in air, but soluble in water, or by spring fastenings. The journals in which the drum works are made slightly moveable on their supports, and a lever furnished with a weight constantly keeps them in their places. The displacement of this lever, being marked on a graduated dial, furnishes indications of the degrees of tension which the cable exerts.

NUNN, W. *Improvements in stereoscopic apparatus.* Dated Dec. 23, 1857. (No. 3148.)

These relate chiefly to the application of glass or other reflectors to stereoscopes, so that more than one person may look through the eye pieces at the same picture at the same time.

NIXON, C. N. *Improvements in attaching, fitting, and securing the rudders of ships, barges, boats, and every other description of sailing or steam vessels.* Dated Dec. 23, 1857. (No. 3149.)

This consists of methods of attaching the rudders of ships, &c., so that they can be more readily shipped and unshipped, and also rise of themselves on coming in contact with any obstacle, and again return to their proper position, and so that such motion of the rudder shall not affect the steering gear. There are several arrangements given for effecting this result, mainly consisting of hinged gudgeons.

KYNASTON, A. F. *An improved slip or disengaging hook.* Dated Dec. 22, 1857. (No. 3150.)

This invention was described and illustrated at p. 73 No. 1798 vol. 68.

MOSS, J., T. GAMBLE, and J. GAMBLE. *An improvement in the manufacture of cast-steel hoops and cylinders.* Dated Dec. 23, 1857. (No. 3151.)

This consists in pouring the metal into a mould placed vertically through two mouths at the upper part, and near the two top sides of the mould or mould casing. These mouths rise sufficiently high from the periphery of the annular space into which the metal is to be run, to receive the whole of the honey-comb or top surface of the vessel, which is cut off from the hoop, &c., after being removed from the mould, a solid cast-steel ingot in the form of a hoop or cylinder remaining.

WILLIAMSON, A. W. *Improvements in treating scammony root and commercial scammony, to obtain the active principle therefrom.* Dated Dec. 23, 1857. (No. 3154.)

The crushed or ground roots are boiled for about 24 hours in a stoneware vat, with a mixture of about 100 measures of water and 1 of acid (enough to cover the roots), being occasionally stirred. The acid solution of sugar thus formed is then removed from the solid residue by squeezing or otherwise; the dry residue being soaked in water and again squeezed. To dry the washed residue more completely, it is spread in small pieces on a plate heated by steam. The remaining woody matter contains the acids of the scammony uncombined with sugar, and caustic alkalies may be used for the extraction. Alcohol is, however, preferable, in using which the washed dry root is introduced into a cylindrical iron vessel, with a close-fitting lid, communicating at its upper end with the condenser of a still, and its lower end with a vessel for receiving the extract. Alcohol is introduced into the still, and made to boil. The vapour arising from this passes into the condenser, and thence, after condensation, through the root in the extracting box. At the end of the process the spirit adhering to the root may be recovered by blowing steam through the box, and condensing as from the still. The resin acids left in the still should be freed from the traces of alcohol by a jet of steam, and then dried in a steam evaporating pan till a sample on cooling becomes quite hard and brittle.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

BLYTH, F. M. *An improved apparatus for cutting and pulping turnips and other roots.* Dated Dec. 17, 1857. (No. 3096.)

Here the front or cutting plate has upon it angular pieces placed longitudinally, to assist in retaining the roots when being cut. The barrel is formed with plates on cylindrical flanges, having longitudinal open spaces for the cut root; also to pass stones through the barrel that fall in with the roots. The barrel has a number of small steel knives projecting, and, to ensure the parts being cut that are left by the small knives, the patentee fixes wider knives, so that in every revolution of the barrel the surface of the roots that are being cut will be cleared. Each knife will have two cutting edges to cut each way by reversing the motion of the barrel.

BLIZZARD, W. *Improvements in the treatment of india rubber by a new process for the manufacture of a crystalline and colourless varnish for waterproofing all kinds of textile fabrics and papers without smell, and without in any degree altering their appearance, and for making divers varnishes and paints.* Dated Dec. 17, 1857. (No. 3097.)

The inventor proceeds by taking any of the resinous spirits, as naphtha, camphine, turpentine, &c., dissolving the india rubber, and so acting upon the compound as to produce a crystalline solution of india rubber, which he calls a varnish, and on which he can still further operate for decolouring, obtaining thereby a crystalline colourless solution of india rubber for waterproofing purposes, and for making varnishes and paints.

MASON, M., and T. MARKLAND. *Improvements in machinery or apparatus for printing.* Dated Dec. 17, 1857. (No. 3099.)

This consists of a roller revolving on its axis with a part of it covered with caoutchouc, &c., the said roller being turned by an endless band. A cylinder contains the type or device to be impressed, and the necessary inking apparatus, and above that a vessel formed so as to constitute a self-acting feeder to supply the type or device with ink.

WOOFE, W. *Improvements in ploughs.* Dated Dec. 17, 1857. (No. 3104.)

This consists in placing behind the coulter, and so as to act upon the earth being turned over upon the mould board, a toothed roller or revolving harrow, whereby the earth is pulverised while the ploughing operation is being performed, and during the formation of the furrow. Also, for the better dividing of the earth, the inventor fits blades upon the mould boards. To diminish the draught of ploughs, he mounts a small wheel at the rear end of the sole of the plough, and carries it upon a slide or small shaft held at the back of the beam of the plough. He fixes the coulters by passing the coulter rod through a box or sheath wherein it is held firmly at the upper part, but is free to play within limits in the lower part, then by means of two adjusting screws, one on one side and the other on the opposite side, he regulates the position of the coulter.

JOHNSON, J. H. *Improvements in lubricating the journals of shafts and spindles.* Dated Dec. 17, 1857. (No. 3105.)

The main feature here consists in the use of a double or single tube fixed on to and surrounding the shaft, &c., to be lubricated, the lower portion of the tube (which is perforated) rotating in an oil reservoir, and thereby constantly raising the oil up to the bearing by capillary attraction and the screwing motion imparted to it by the rotation of the lubricating tubes.

JOHNSON, J. H. *Improvements in machinery or apparatus for hulling cotton and other oleaginous seeds, applicable also to the hulling of cereals.* (A communication.) Dated Dec. 17, 1857. (No. 3106.)

This consists of a hollow cylinder of wire gauze, or of rasp-cut plates, within which rotates a stiff brush. The seeds are fed into this cylinder from a vibratory hopper, which separates all large extraneous matter therefrom before entering the cylinder. The action of the brushes is to remove the fibres of cotton seed, and to loosen or tear slightly the husk or outer skin of the kernel. A fan blast separates the fibres from the grain, which latter falls down a shoot into a second machine, which completes the process of hulling. This machine contains a hollow cylinder composed of a number of file-cut metal plates. Within this cylinder rotates at a high velocity another cylinder, also composed of a number of metal plates, having their outer surface rasp cut. The seeds are supplied between these concentric cylinders, for being rubbed and freed from their husk, from a hopper furnished with a spiked regulating feed roller and a sliding door.

TAYLOR, J. H., and R. T. BARRETT. *Improvements in apparatus for the prevention of smoke and for effecting a better combustion of fuel in steam-boiler furnaces.* Dated Dec. 18, 1857. (No. 3108.)

Here it is proposed to supply a current of heated air to the boiler furnace by a fan or blower, such current being heated by passing along pipes which traverse the flues, so that the same heat which is employed for generating steam serves also to heat the air supplied to the furnace. The inventor proposes to regulate the speed of the fan or blower by cone pulleys, acted upon by the damper or pressure regulator for which letters patent were granted to P. Marcus, 14th Oct., 1856, by which means, as the pressure increases in the boiler, the blast will be diminished, and *vice versâ.*

BOWLAS, D. *Improvements in machinery or apparatus for preparing and spinning cotton and other fibrous substances.* Dated Dec. 17, 1857. (No. 3109.)

This is applicable to machinery employed for preparing and spinning, wherein the top rollers or bosses are made hollow, and mounted upon a spindle, and revolve loosely thereupon. It consists in imparting rotary motion to the spindle upon which the top roller or boss revolves, which may either be effected by connecting the spindle with the bottom roller by spur pinions, or by an extra shaft and toothed pinion placed above the top roller; which has the effect of causing the spindle of the top roller to revolve, the slight variation in speed at which the spindle rotates being governed by the relative number of teeth in the spur pinions.

WILKINSON, T. C. *Improvements in pump valves.* Dated Dec. 18, 1857. (No. 3110.)

This relates to a peculiar construction of valves for lift and force pumps. In one arrangement of his valves, the inventor uses a circular valve having a clear passage round, and an opening through the centre; it is packed by elastic rings. The portways are cast with bridges, or in the form of a grating, to prevent the packing rings from slipping into them. In another modification he constructs the valve of a cylindrical form (vertical section in the form of an H) working fluid-tight in a cylindrical chamber on the pump casing. When the working piston is put in motion, the vacuum on one side and the compression on the other will move the valve, so as to open the inlet on one side and the outlet on the other alternately.

NEWBY, T., J. CORBETT, and W. H. PARKES. *A new or improved method of treating or coating steel pens and penholders to prevent the oxidation of the same, which method of treating or coating may also be applied to other articles of iron and steel.* Dated Dec. 19, 1857. (No. 3115.)

Two pounds of bitartrate of potash are dissolved in 5 gals. of water, the solution filtered, and heated to 160° or 180° Fahr. A plate of tin is then suspended in the solution, connected by a copper wire to the zinc of a voltaic battery, and the pens, penholders, &c., are suspended in the solution by copper wires, which connect them with the copper of the battery. In a short time the articles are coated with tin, acquiring a silvery appearance.

BROOMAN, R. A. *Improvements in signalling, in order to prevent collisions between trains upon railways.* (A communication.) Dated Dec. 19, 1857. (No. 3120.)

The object here is to produce, by electrical apparatuses, light in a lamp supported upon a post at the side of the line, provided with white and red glasses, and caused to revolve by clockwork to expose and show a white light before and a red light after the passage of every train. The light is produced from a wick dipped into a spirit reservoir in the lantern upon being ignited by an electric spark, and is extinguished by being brought under a fixed extinguisher held in the lantern.

BARTLETT, J. *An improvement in weighing machines.* Dated Dec. 19, 1857. (No. 3122.)

This consists in causing the weight to travel along the steelyard of weighing machines, or along the lever of other weighing machines, by a pinion which takes into a rack upon the lever, and in mounting an indicator upon the pinion shaft, in order that the one operation of turning the pinion shaft shall not only propel the weight along, but shall at the same time indicate the fractional parts of the measure to be ascertained.

COLES, T. *An improvement in chaff cutters.* Dated Dec. 19, 1857. (No. 3123.)

This consists in casting the worm for giving motion to the feed rollers in two halves, and with a worm on each end, one being a double and the other a single worm. These worms fit accurately on the spindle to which the knife-wheel and crank-handle are connected, and are held thereon by a collar and screw. The object is to enable two different lengths of chaff to be cut, by adjusting the worms on the spindle so as to bring either the double or the single worm into gear with the wheel which causes the feed rollers to rotate.

BOUGH, W. *Improvements in lamps and wicks for burning resin and other oils and fluids, parts of*

which improvements are applicable to argand gas burners. Dated Dec. 19, 1857. (No. 3124.)

Here an ordinary burner containing a wick holder and wick is used, and the resin, oil, or fluid, is supplied in the ordinary manner from a suitable vessel, and rises to nearly the top of the metal tubes forming the burner. On the interior of the burner, and concentric with it, is a cylinder, leaving space between it and the inner tube to allow a free flow of air to the interior of the flame. The cylinder descends some distance within the burner, and is closed at bottom. There is a small tube which passes through the bottom of the cylinder and rises above the cylinder, and the lower end of this tube descends below the cylinder, and is connected with the source of oil or fluid, so that it may rise into the tube and flow from it by a small hole into the cylinder. In the upper end of the inner tube is introduced the stem of a button; the inventor prefers a button of talc. The upper end of the cylinder may be open, or it may be closed, and have small perforations for the passage of vapours generated therein, which will be burned as they rise out of the cylinder. In constructing and applying wicks to lamps which burn resin oil he employs strong felted woollen cloth.

Mushet, R. *Improvements in the manufacture of iron.* Dated Dec. 19, 1857. (No. 3125.)

This consists in adding to cast iron a compound of iron, carbon, and manganese.

Nosworthy, J. H. *Apparatus for exhibiting cards, bills, and other like advertisements.* Dated Dec. 21, 1857. (No. 3126.)

This consists in suspending the cards, bills, &c., from, or affixing them to, peculiarly constructed posts, after being properly secured by an adjustable frame or frames.

Hamilton, J. *Improvements in ship-building.* Dated Dec. 21, 1857. (No. 3128.)

This relates mainly to constructing the keels, keelsons, and lower portions of a vessel without the use of timber of the large dimensions now required for the purpose. And also in making a provision against the dry rot in vessels, by forming shallow channels in the surface of the timber in the direction of the grain of the wood on the surfaces of the timbers, planking, and ceiling which are in contact. By this arrangement air cells or passages are formed throughout the whole structure, through which air, gases, or fluids may be forced if it should be deemed advisable.

Kendall, W. J. *An improved safety signal for railways.* Dated Dec. 21, 1857. (No. 3129.)

The signal post consists of a hollow cast-iron pillar, surmounted by a board upon which the word "signal" is marked large. In the interior of the signal post is a vertical rod capable of moving freely up and down, and to this is firmly attached a horizontal arm of spring steel, which passes through a slot in the side of the signal post next to the railway, and projects to allow of its coming into contact with one of two levers connected with the engine, as it passes the post. Other parts are included. The operation is as follows:—When the signalman sees an approaching train, or hears the whistle, he turns the windlass so as to raise or depress the spring signal arm, which, coming into contact with one of the horizontal levers on the engine, as the train passes, will raise the corresponding signal plate, and thus call the attention of the engine driver, who then will glance at his signal box as he passes the post; but, should he neglect to do so, the sound caused by the contact of the spring signal arm and lever and the overrunning of a certain ratchet will not fail to attract his attention. When he has attended to the signal he must press a knob, and the signal will again be ready for action.

Myers, W. H. *An improved coffee-pot, made of metal or earthenware, to contain coffee and milk or cream separately, the same being used as a chocolate-pot, the same invention being applicable to tea-pots, for the same purposes, made either in metal or earthenware, the same invention being applicable to table urns, and the same invention being applicable to jugs, made either in earthenware, or glass, or metal, to contain spirits and water, or other liquids, in different compartments.* Dated Dec. 21, 1857. (No. 3133.)

Inside an outer case the inventor places a lining, forming a chamber between the two. He also places on the outer case a hollow handle and a spout. He connects the spout to the inner chamber, out of which the solution of coffee, chocolate, or tea will flow. He also provides a certain small tube and holes, and through a funnel-shaped cover or lid he passes milk or cream for being heated by the radiation of heat from the inner case containing the hot solution of coffee, chocolate, or tea. The milk will run into the outer chamber, and will flow or not through the spout at the will of the person using the same, by raising the thumb from a hole, or covering the same by the thumb. The solution of coffee, &c., will flow from the inner chamber through the spout in the ordinary manner. Modifications are included.

Brooman, R. A. *Improvements in breech-loading fire-arms.* (A communication.) Dated Dec. 21, 1857. (No. 3135.)

This invention is the same as No. 1753, described at p. 307, Vol. 68.

Greenhalgh, O., and R. Hutchinson. *Improvements in apparatus for stirring and mixing colours for calico printing and other purposes.* Dated Dec. 22, 1857. (No. 3143.)

This relates to the addition of certain parts to the ordinary apparatus, in order to effect a more perfect stirring of the colour, and consists in combining with the usual revolving vanes additional vanes, which revolve at right angles, or at another angle thereto. In one arrangement a boss upon the axis of the usual vane carries a fixed bevel wheel, taking into another mounted upon a cross shaft, on either end of which is affixed an additional vane. As the first axis therefore revolves, it communicates rotary motion to the latter, and effects a stirring of the material in a vertical direction.

Murray, J. *Improvements in propelling ships and vessels.* (A communication.) Dated Dec. 23, 1857. (No. 3152.)

Here paddles are used consisting of water-tight hollow quadrants of a cylinder having five surfaces, namely the curved or cylindrical surface, the two quadrantal sides, and the two sides which form the right angle of the figure. The paddles are hung upon horizontal centres at the apex, a pair being placed in a frame at the stern of the vessel, one at each side of the keel, and are made to oscillate within, and in immediate juxtaposition with, a curved concave surface of a rather larger radius than that of the paddle. These paddles are caused to strike the water alternately, by means of any convenient arrangement of mechanism.

Norton, C. *Carriage-door shields, to prevent accidents arising from the shutting of railway or other carriage doors, also applicable for nursery doors or any other doors where children may have access, or where safety from accident may be an object.* Dated Dec. 23, 1857. (No. 3153.)

This consists in attaching two corrugated or circular pieces of metal, one to the inside of the hinge stile of the door to move in a circular groove in the hinge post to receive it; the other piece to be screwed to the inside of the carriage to protect and overlap the piece attached to the door when the same is open.

White, G. *A semiq-melodion or instrument for demonstrating musical writing.* (A communication.) Dated Dec. 24, 1857. (No. 3155.)

This instrument, which is enclosed in a box with doors, consists of a dial plate exhibiting the five horizontal lines of the stave, crossed by vertical lines, and furnished with a series of moveable dots or buttons, each representing one note, and each of which may be moved one step towards the right and left hand side, when the sign for the flat or sharp will protrude through openings in the dial plate, and place itself above the note. A moveable

slide, with series of keys, is situated near the upper part of the dial plate. Each key serves for putting the notes of the dial plate in the required chromatic scale by mechanical arrangements in the box. The instrument is furnished with bellows and valves, with vibrating blades for giving the sounds of the notes shown on the dial plate, with their signs of flat and sharp.

ADDERLEY, S. H. *Improvements in the manufacture and ornamentation of pencil cases, penholders, reserves or cases for leads, needle-cases, and ink-holders, and other tubular cases.* Dated Dec. 24, 1857. (No. 3157.)

The inventor takes a rod less in diameter than the pencil-case to be made, and rolls upon it alternate layers of linen or cotton fabric and paper, and overspreads such layers with paste. After the tube thus made is dry, its figure is perfected by drawing it upon its mandril through a draw plate. The tube is then saturated with linseed oil, dried in a stove, and afterwards varnished and dried. It is next ornamented by japanning, &c., or by attaching thereto pieces of shell, either alone or combined with metal. The tube made and ornamented as described is made into a pencil-case by the introduction of the usual mechanism.

PLAYLE, T. *Improvements in two-wheeled carriages.* Dated Dec. 24, 1857. (No. 3158.)

This applies chiefly to spring carts in which the centre of gravity is changed either by moving the body of the vehicle, or by raising or lowering the shafts. It consists in dispensing with the usual horizontal movement of the body of the vehicle, and in adjusting the draught by vertical screws fixed at the hinder part of the vehicle.

WILSON, H. C. F., and T. GREEN. *A machine or apparatus for making rivets.* Dated Dec. 24, 1857. (No. 3162.)

This apparatus is composed of a framing supporting a horizontal shaft, on which are fixed cams operating upon four vertical levers, two of which carry tools for shaping the heads of rivets, and the other two having inclined surfaces, which, as they are alternately raised and lowered, operate upon sliding cutting tools for dividing the metal into proper lengths for each rivet. The details cannot be described without engravings. An important feature in the machine consists in its being double-acting—that is, while one side is discharging the ivet last made, the opposite side is making another.

PROVISIONAL PROTECTIONS.

Dated May 24, 1858.

1156. J. Edwards and T. Loveridge, of Aldermanbury. Improvements in the manufacture of buttons and other fastenings for articles of dress.

Dated June 29, 1858.

1468. H. Greaves, of Westminster, civil engineer. Improvements in apparatus for moulding, casting, and coating metal articles.

Dated July 1, 1858.

1476. T. Whiteley, of Stainland, York, paper and millboard manufacturer. Improvements in the manufacture of millboard, and in machinery or apparatus for cutting millboard and paper.

1478. J. Kingsley, of Great Coram-street, lieutenant. Improved mechanical arrangements applicable to preventing the sudden bursting of steam boilers.

Dated July 2, 1858.

1486. E. Lord, of Todmorden, machine maker. Improvements in looms for weaving, parts of which are applicable to other machines, and in machinery for making the crank shafts of looms and other machines.

Dated July 6, 1858.

1514. J. Dodd and T. Phillips, both of Ruabon. Improvements in the slide valves of steam engines.

Dated July 10, 1858.

1553. A. Porecky, of York-street North, Hackney-road. Improvements in the manufacture of certain articles of whalebone, horn, tortoiseshell, and other corneous matters, or the artificial imitations thereof.

1555. W. Langshaw, of Bolton, manufacturer. Improvements in machinery or apparatus for weaving fancy looped or knotted fabrics.

1557. P. Burrell, of Middle Scotland-yard. Improvements in ventilating sewers and other receptacles of sewage.

Dated July 12, 1858.

1559. J. Loach, japanner, and J. Cox, electroplater, both of Birmingham. Certain improvements in ornamenting glass with perforated metallic and other plates.

1563. R. A. Brooman, of 166, Fleet-street, E.C., patent agent. Certain new or improved machinery for the manufacture of wire heddles. A communication.

1565. N. Defries, of Fitzroy-square, consulting gas engineer. Improvements in apparatus for measuring gas.

1567. T. Earnshaw, of Cambridge-terrace, Croydon. Improvements in the manufacture of night lights.

Dated July 13, 1858.

1569. J. Webster, of Birmingham, engineer. An improved manufacture of certain kinds of metallic ingots.

1571. J. Travis, gentleman, T. Sugden, and F. Sugden, machinists, all of Oldham. Certain improvements in lubricating the valves and pistons of steam engines.

1573. J. J. Field, of Paddington, chemist. A new method of supporting and carrying telegraph wires, ropes, and cables.

1575. A. Shanks, engineer, of Robert-street, Adelphi. Improvements in machinery for planing, slotting, and shaping metals.

1577. R. Wilson and A. Horwood, of Salisbury-mews, Great Quebec-street. An improved pipe joint.

Dated July 14, 1858.

1579. C. de Poorter, of Brussels. Improvements in hand or power looms.

1581. R. Burns and J. Rea, both of Liverpool, engineers. Improvements in machinery for grinding bones and other hard substances.

1583. F. Chapusot, of Turin, gentleman, and V. Avril, of Paris, civil engineer. Improvements in producing a more or less perfect vacuum, and applying the same to industrial purposes.

1585. E. Owen, of Blackheath, chemist. Improvements in distilling.

1587. J. Maclean, of Edinburgh, gentleman. Improvements in machinery or apparatus for laying or submerging telegraph cables in water.

1589. H. W. Wimshurst, of Wilmot-road, Dalston, gentleman. An improvement in stove grates.

1591. J. Fowler, jun., of Cornhill, engineer. Improvements in apparatus used when ploughing, tilling, or cultivating land by steam power.

Dated July 15, 1858.

1593. R. Brazier, of Wolverhampton, manufacturer. Improvements in repeating fire-arms.

1595. C. P. Aston, of Cross-street, gun maker. Improvements in breech-loading arms.

1597. H. Bevan, of Shrewsbury, accountant. A new or improved machine for effecting or facilitating arithmetical operations.

1599. T. Bartlett, M.D., of King's-road, Bedford-row. Improvements in stoves, fire-places, and furnaces.

1601. W. E. Newton, of Chancery-lane. An improved mode of giving alarm in cases of fire in houses, ships, or other buildings. A communication from F. Tovo, of Turin.

Dated July 16, 1858.

1603. T. Leigh, of Manchester, commission agent. Improvements in machinery or apparatus for sizeing warps.

1605. C. de Bergue, of Dowgate-hill, engineer. Improvements in electric telegraph cables for submarine purposes, and in the machinery for manufacturing such cables, and also in the machinery to be used in paying such cables out of ships at sea.

1607. P. Arkell, of North Woolwich, engineer, and A. Melhado, of Bayswater, gentleman. Improvements in the submerging of telegraph cables.

1609. C. S. Putnam, of New York. An improvement or improvements in the apparatus for hardening vegetable gums, oils, and other substances susceptible of being hardened by steam.

1611. W. A. B. Bennett, of Boulogne. Improvements in military capes or cloaks.

Dated July 17, 1858.

1613. J. Spence, of Liverpool, iron merchant. An improvement in the manufacture of tin plates and terne or leaded plates.

1615. W. Wildes, of Maidstone, paper maker. An improved arrangement or arrangements of machinery for reducing vegetable matter to pulp.

1617. W. Pidding, of Southwark-bridge-road, gentleman. Improvements in securing and forming envelopes.

PATENTS APPLIED FOR WITH COMPLETE SPECIFICATIONS.

1667. M. Shanty, of Meard's-street, Soho. A mercurial level, to show the height of liquids in enclosed and opaque vessels, vases, and principally for steam boilers. A communication from E. Legris, of Paris. Dated 24th day of July, 1858.

1669. M. Shanty, of Meard's-street, Soho. A metallic trimming for intercepting water, air, gas, or steam round piston rods, of whatsoever they may be; the same may be applied to the joints of steam machines. A communication from E. Legris, of Paris. Dated 24th day of July, 1858.

NOTICES OF INTENTION TO PROCEED.

(From the "London Gazette," August 3rd, 1858.)

564. H. Brocklebank. "Time-keepers."
573. J. Young. "Chronometers," &c.
578. P. M. Parsons and W. Dempsey. "Railways."
582. P. Browne. "Screw propellers; raising fluids."
592. J. Thomas. "Counting and registering."
602. A. S. Stocker. "Railway axles and tubes."
604. J. Rowbottom and T. Standeven. "Washing, wringing, and mangling machines."
612. J. C. Wilson. "Wearing apparel."
620. G. A. Biddell and W. Balk. "Steam boilers."
621. J. F. Brinjes, jun., and H. J. Collins. "Animal charcoal."
622. W. and R. Wood. "Spinning, doubling, and sizeing yarns."
624. A. L. Thirion. "Transforming circular movements."
632. F. Foucou. "Furnaces."
636. F. A. Chevallier. "Photographic apparatus."
640. J. Parkes. "Eyelets."
647. J. and J. F. Newman. "Spectacles."
652. W. T. Eley. "Cartridges."
658. W. Garnett, C. Geldard, and J. Dugdale. "Looms."
661. J. F. Spencer. "Marine engines."
662. J. Horton. "Punching metals."
665. I. Brown and J. Brown. "Manure."
668. W. Davis and T. Harper. "Cutting soap."
672. W. Weallens. "Parabolic governors."
680. J. Musgrave, jun. "Furnaces."
682. J. W. Duce. "Locks and latches."
695. F. R. and J. A. F. Tavernier. "Combing wool."
696. F. J. E. Oosterlinck. "Valve."
697. H. Ward. "Expressing liquids."
698. W. E. Newton. "Corks." A communication.
702. T. F. Robinson. "Cutting cork."
703. T. Greenshields. "Manures."
706. A. Pelez. "A circular cutter." A communication.
785. A. C. Thibault. "Paper hangings."
791. P. Ratel. "Depositing grain and manure."
800. W. E. Newton. "Railway brakes." A communication.
832. J. Luis. "Window frames." A communication.
833. E. F. Sans. "Pressure gauges."
835. A. A. Lutéreau. "Polishing leather, paper hangings," &c.
859. W. Clark. "Taking the altitude of the sun." A communication.
866. J. B. Smith. "Lamps."
883. J. Chatterton. "Electric telegraphs."
909. W. A. Clark. "Expansive bits."
923. T. Dobson. "Forging iron."
963. B. E. Guyot de Brun. "Leather and other tissues."
964. B. L. A. Peaucellier. "Plough."
965. E. T. Hughes. "Paper." A communication.
969. W. Clark. "Motive power." A communication.
1009. H. Ashworth. "Cutting hides or skins."
1049. J. Luis. "Washing apparatus." A communication.
1052. E. Fairburn. "Carding wool."
1178. J. Luis. "Corks and corking bottles." A communication.
1315. J. Luis. "Thrashing machine." A communication.
1395. R. A. Brooman. "Treating wood." A communication.
1416. C. Vero and J. Everitt. "Hats."
1420. Sir J. Paxton. "Horticultural buildings."
1452. J. Luis. "Screw vessels." A communication.
1463. J. Shaw. "Bags."
1464. J. Shaw. "Bags."
1528. J. D. Weston. "Rolling iron."
1547. J. Broadley. "Weaving."
1585. E. Owen. "Distilling."
1613. J. Spence. "Tin plates and terne plates."

The full Titles of the patents in the above List can be ascertained by referring back to their numbers in the Lists of Provisional Protections previously published.

Opposition can be entered to the granting of a Patent to any of the parties in the above List who have given notice of their intention to proceed, within twenty-one days from the date of the Gazette in which the notice appears, by leaving at the Commissioners' office particulars in writing of the objection to the application.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

1707. C. Hodges.	1747. A. Allan.
1722. J. Kerr.	1748. J. Stanley.
1727. J. M. Fillier.	1762. R. A. Tilghman.
1732. J. Hanson.	1777. J. Avery.
1734. H. Mackworth.	1969. J. and T. Hope.

LIST OF SEALED PATENTS.

Sealed July 30th, 1858.

127. J. Gordon.
179. J. A. Manning.
182. W. E. Newton.
187. W. C. Holmes and W. Hollinshead.
188. W. E. Newton.

Sealed August 2nd, 1858.

195. A. Hollis and S. Lee.
214. E. and T. Collingwood.
217. Sir C. Shaw.
218. S. Williamson.
219. S. Dyer.
220. L. F. Candelot.
222. W. Potts.
223. G. Davies.
224. W. White and J. Parlby.
225. W. Ball.
226. J. Miller.
228. F. Mathieu.
229. J. D. Tripe.
230. P. S. Meroux.
232. E. Dench.
233. R. W. Johnson and W. Stableford.
234. W. E. Newton.
235. H. Ball.
240. R. Millard.
242. E. Leigh.
244. B. B. Wells.
247. G. and W. Richardson.
258. B. Looker, jun.
269. T. Neville and W. S. Dorsett.
279. W. Spence.
289. H. J. Sanders and S. Thacker.
290. W. E. Newton.
319. E. Griffiths.
380. A. V. Newton.
393. M. Henry.
405. W. E. Newton.
463. E. Morel.
466. B. B. Stoney.
468. J. H. Johnson.
567. W. H. Rhodes.
663. J. Baillie.
902. J. O. York.
1030. T. and D. Brown.
1083. J. Gardner.
1134. G. F. Muntz.
1174. F. A. Gatty.
1194. G. H. Bovill.
1239. C. Wheatstone.
1241. C. Wheatstone.
1255. J. von Liebig.
1297. F. A. Gatty.
1326. L. A. Bigelow.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions.

NOTICE TO CORRESPONDENTS.

Articles and Correspondence designed for insertion in the ensuing Numbers of the *Mechanics' Magazine* must reach the Office by the Tuesday of each week, at the latest. It is highly desirable that they should be forwarded earlier if possible.

CONTENTS OF THIS NUMBER.

LONDON: Printed and Published by Richard Archibald Brooman, of 166, Fleet-street, in the City of London. Sold by A. and W. Galignani, Rue Vivienne, Paris; Hodges and Smith, Dublin; W. C. Campbell and Co., Hamburgh.

Mechanics' Magazine.

No. 1827.] SATURDAY, AUGUST 14, 1858. [PRICE 3D.

Edited by R. A. Brooman and E. J. Reed, 166, Fleet-street, London, E.C.

SCHINZ'S PATENT APPARATUS FOR MANUFACTURING PRUSSIATE OF POTASH.

Fig. 1.

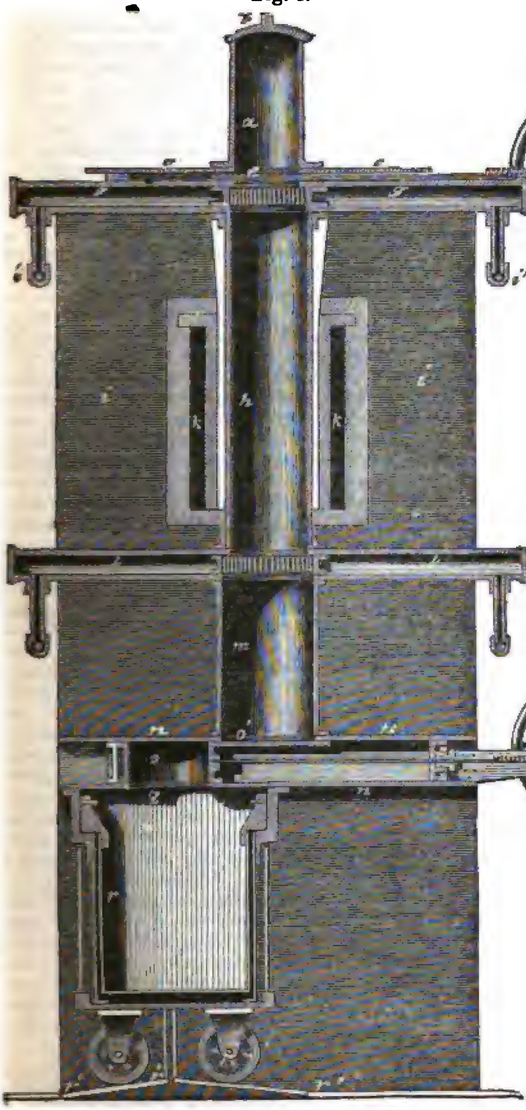


Fig. 3.

Fig. 2.

SCHINZ'S PATENT APPARATUS FOR MANUFACTURING PRUSSIATE OF POTASH.

Mr. Charles Schinz, of Camden, New Jersey, United States, at present residing at Oedenwald, Wurtemburg, has patented in this country an improved apparatus for manufacturing prussiate of potash. Mr. Schinz was so unfortunate as to fail to file his final specification when it was due, in consequence of a delay in a foreign local post-office; but the Lord Chancellor allowed him an extension of time for the purpose, and the specification (No. 67) has since been filed. His patent right is therefore secured.

The invention consists of an apparatus for manufacturing prussiate of potash, in which the formation of cyanuret of potassium is effected by the contact of potash or its compounds in a state of reduction with nitrogenous gases, or with the products of dry distillation of nitrogenous matters, without contact with the air. It is constructed in the following manner:—Fig. 1 of the engravings on the preceding page is a sectional elevation of the apparatus. At the upper part of it is a feeding cylinder, *a*, of iron, furnished with a close-fitting cover, *b*, and supported on a base-plate of iron, *c*. This base-plate has in it a circular hole corresponding to the interior of the cylinder. Beneath the base-plate is tightly fixed an iron frame, in which moves a slide, *e*, shown in horizontal section in fig. 2, which slide also has a circular hole, *e'*, that may either be brought beneath or withdrawn from the hole in the base-plate. This slide has motion imparted to it when necessary by means of a rod, *f*, worked by a rack, pinion, and hand-wheel. Beneath the iron frame is formed a flue, *g*, which communicates by means of a circular grate with a vertical retort, *h*, immediately below the circular holes before mentioned. The circular grate is moveable, in order that it may be cleaned when requisite. The furnace is situated below the flue, *g*, and from that flue, beyond the walls, *i i*, of the furnace, are led out two gas-pipes, *i' i'*, one at each end. The vertical retort, *h*, is formed of a sheet-iron tube, and is surrounded by sand placed in a space left for the purpose, in order to admit of the expansion and contraction of the retort. The fire-place surrounds the lower part of the retort, and has a cylinder of fire-clay, *k*, interposed between it and the sand. The fire-place is also lined with fire-brick. The retort, *h*, is supported by a second flue, *l*, similar to, but larger than the first, within which also a circular fire-grate is placed, and which is also furnished with gas-pipes at its ends. This flue communicates by means of the grate with a vertical cylinder, *m*, placed immediately beneath the retort, *h*, but larger than it in diameter. This cylinder, *m*, holds the matters which descend into it while they cool, and, being air-tight, preserves them from contact with the atmosphere. It is supported by a rectangular box, *n*, in which moves a flanged cylindrical slide, *o* (shown in horizontal section of fig. 3), furnished with a plate, *o'*, and so worked by a rod, rack, pinion, and hand-wheel, that it may open or close a passage into a receiver, *q*, placed on one side of, and not immediately beneath, the central passage of the apparatus. This receiver turns on wheels, and has at the top a flange which fits tightly against the slide box, *n*. It also contains a cylindrical sieve of iron wire, *r*, which may be moved by handles into the receiver, *q*, when empty, and out of it when full. The receiver, *q*, with the rails, *r'*, upon which it runs, is lifted bodily by means of any suitable apparatus, so as to bring its flange up tightly against the slide box, *n*.

The operation of the apparatus is as follows:—The feeder, *a*, is filled with pieces of charcoal or coke of about the sizes of walnuts, with which are mixed some dry potash and iron filings or oxide of iron. The cover, *b*, is then placed on the feeder, and the first slide, *e*, so moved by the hand-wheel, the pinion, the rack, and the rod, as to allow the charge to drop into the retort, *h*. The diameters of the feeder, the retort, and the cooling cylinder being successively larger, the materials assume a conical form within the grates, which contributes to a regular inflow and outflow of the gases, and prevents the obstruction of the grates by the contact of the materials. The gas-pipes being connected with that part of the apparatus from which the nitrogenous gases issue, these gases find their way to the materials in the retort. The liberation of potassium takes place in that part of the retort only which is surrounded by the fire, but, as its volatility gives it a tendency to ascend, it rises and meets the nitrogenous gases, and is taken up, combining with the cyanogen. By these means the chemical action is enhanced, and a volatilisation of the potassium prevented. The gases pass off through the lower grate and flue and suitable pipes, but not until having passed through sufficient materials to effect the full absorption of the nitrogen which is available in them for the formation of cyanogen. If the contents of the retort are too powdery, the passing off of the gases may be aided by leading the delivery-pipes to an exhauster, like that used in gas works. After the operation has proceeded sufficiently long to saturate a part of the formed

potassium with cyanogen, the emptying slide, *o*, is moved under the retort, and a portion of the produce drops into it; the slide is then forced forward by the hand-wheel, the pinion, the rack, and the rod, and the contents fall into the receiver, *q*. An equal quantity of fresh materials is then supplied to the feeder, *a*, and so on. Although the feeding is thus intermittent, the manufacture of the prussiate is continuous all the time the nitrogenous gases are supplied. A modified form of the apparatus before described, from which the lower flue and grate are omitted, may be used for the distillation of the nitrogenous matters.

The advantages attending the use of the apparatus before described are:—First, a saving of fuel, arising partly from the heating up of the materials by a portion of the heat which would otherwise be lost before it comes to the place where they are exposed to direct heat; secondly, a saving of potash or its compounds by the opposition which the peculiar disposition of the apparatus offers to its or their volatilisation; thirdly, a saving of nitrogenous matters, resulting from the extended contact of the combining substances, and from the working of them in a closed space; fourthly, an increase of produce resulting from the causes just enumerated, and from the fact that the new produce is sheltered from the air until it is sufficiently cool to prevent the combustion of the cyanogen, and its formation into cyanic acid; and also from the fact that all compounds of sulphur and phosphorus are excluded from the nitrogenous gases; fifthly, an economy of manual labour, resulting from the continuity of the operation, and from the employment of the mechanical means described.

ON WAVES AND CALVER'S WAVE SCREEN.

Mr. E. K. Calver, who holds the office of Admiralty Surveyor on the east coast of England, and is known to our readers as the author of an excellent work upon Tidal Harbours,* has issued a treatise † on a Wave Screen of his invention, which is brought forward very opportunely, the Report of the Committee of the House of Commons on Harbours of Refuge having recently been published. Mr. Calver divides his new work into four sections; the first treating of waves, and the powers exerted by them; the second, of breakwaters; the third, of refuge harbours; and the fourth, of the wave screen which he has invented. We shall glance at each of these entertaining chapters successively.

In his remarks upon waves, Mr. Calver first explains the fact that, while waves themselves move onward at the rate of many miles per hour, the particles of water composing them have but little motion besides a vertical one, and suggests as an apt illustration of the case the placing of a round roller under a cloth, and the rolling of it across a table. He next treats of the height, shape, and rates of waves. With regard to the first, he reminds us that the late Dr. Scoresby stated in a communication to the British Association in 1850, that during several hard gales in the Atlantic he had measured many waves of about 30 feet, but the highest was 43 feet from the hollow to the crest. Another authority assigns 45 feet as the height of Atlantic waves measured at the island of Ascension, and declares that at times they attain an elevation of 60 or 70 feet in the neighbouring open sea. On the other hand, a gentleman of ingenuity and observation, in giving evidence before the Select Committee on Shipwrecks in 1843, said, "I have measured the height of waves in the Atlantic in a heavy gale, and I have found none to exceed 19 feet in height from the trough of the sea to the highest point,"—and, upon its being remarked, that perhaps the vessel was not upright, and his measurement was faulty, rejoined, "Of course I made allowances, but, after repeated trials, I have found none to exceed 19 feet." Mr. Thomas Stevenson, in the article "Harbours" in the "Encyclopædia Britannica," remarks, "At the mouth of a harbour on the German Ocean, with a fetch (or expanse in front) of 600 miles, the writer had observed for him the height of waves during south-easterly gales, and on one occasion the result was 13½ feet from the crest of the wave to the trough of the sea. In deep water, and with a north-easterly gale, there is no doubt that the waves of the German Ocean will attain a height considerably greater than this." The foregoing example, supplied by the Messrs. Stevenson, agrees with one by the Comte de Marsilli, quoted in the same article, viz., "that the highest wave on the shores of Languedoc, in the Mediterranean, where the breadth of the sea is 600 miles, was 14 feet 10 inches." In estimating the probable height of a deep-water wave on the eastern coast of Eng-

* See *Mechanics' Magazine*, vol. 59.

† *On the Construction and Principle of a Wave Screen, designed for the formation of Harbours of Refuge.* By E. K. Calver, R.N. London: J. Weale, 57, High Holborn. 1858.

land, where the breadth of the sea in front is about 300 miles, or half that quoted above, Mr. Calver assumes that 15 feet for the maximum height of a wave will be rather over the mark than under it. As regards shape, the length of the wave in the direction of motion, or the distance from hollow to hollow, has no fixed relation to the height. The water continues to undulate long after the wind which produced the waves has ceased, and they advance with an undiminished length, while their height gradually decreases under the influence of gravity or other resistance. Again, waves move with unequal velocities. But even large waves do not attain to any considerable rate. "It is no unusual circumstance," says Mr. Calver, "for a vessel going 12 or 14 miles an hour through the water to keep nearly 'neck and neck' with them, and, though the undulations eventually pass her, they do so but slowly. The writer has several times noticed by measurement, that a 6-feet wave moves at the rate of about 12 miles an hour, and it is probable that a 15-feet wave seldom exceeds the rate of 15 miles an hour."

With respect to the depth to which waves exert their influence, Mr. Calver remarks, that in typhoons, and other violent tempests of tropical regions, where waves of great height are generated, the influence of the wave has been known to extend to a great depth; but, as there are no such billows on our shores, similar effects cannot be looked for. That waves occasion a disturbance at a depth of at least 15 fathoms upon our eastern coast, is apparent from water of that depth being often charged during gales of wind with the detritus or matter comprising the bottom; and the author has observed waves of 6 or 8 feet change water with a depth of 7 or 8 fathoms. The late Professor Edward Forbes mentioned, that the *Venus Cassina*, a large shell not known to live at less depth than 7 fathoms, is often thrown up during heavy gales on the coasts of Scotland, Ireland, and the Isle of Man; and Mr. Wilson, the Harbour Master at Holy Island, on the coast of Northumberland, informed the author, that the *Pegasus* steamer, which sank in 11 fathoms a little to the northward of the Goldstone, lay there till the occurrence of a heavy gale from the north-eastward, when she broke up at high water, and part of her wreck was driven ashore. Mr. Coode, the resident engineer for the construction of Portland breakwater, in his under-water examinations of Chesil Bank, obtained a clear proof of the influence of the wave at a depth of 8 fathoms; and during the survey of the North Sea conducted by Captain Washington, the present Hydrographer of the Navy, it was noticed that the sea had the power of moving shingle towards the main at even a greater depth. That this action of the wave, whatever it be, is not a very decided one, is obvious. The Astronomer Royal stated in evidence in 1845, that "the motion of waves diminished in descending with a degree of rapidity which nobody would imagine at first. Suppose," he says, "a wave 10 feet long from ridge to ridge (and the same applies to every one, except one of very great length, like a tidal wave), if you descend 10 feet below the surface, the disturbance of the water is less than $\frac{1}{500}$ part of what it is on the surface; and, if you descend 10 feet below that, it is diminished 500 times again—the reduction goes on in geometrical progression." Major-General Pasley, in writing to Sir Byam Martin on Dec. 1, 1845, stated that "it was found by the divers employed in removing the wreck of the *Royal George* at Spithead, that the action of the waves was nearly entirely superficial—that they could work as effectively in the heaviest sea as in a calm, and that they were often most successful in strong gales of wind." These facts should be considered by those who are adverse to light cables for deep-sea telegraphs.

From the oblique action of the wind upon the water, a general drift is given to the surface particles during gales; the friction of the wind sharpens the undulation, and has, as it were, a tendency to blow the summit of it over. "Every deep-water wave in storms," says Mr. Calver, "is more or less crested, and the summit (breaker-like) doubles over, and runs as foam down the front incline of the undulation. The velocity of this broken or dead water bears but a small proportion to the velocity of the undulation upon which it is formed, for every seaman will have observed, that a broken crest occurring astern of his vessel when she is making good way, is quickly distanced and left behind, whereas the undulation will overtake and pass the ship. The same feature may often be observed even in a calm day, if the undulations happen to be advancing against an opposing current. An undue importance is often given to these broken crests, and they are confounded in volume and effect with the massive and powerful breaker on the shore. This exaggerated idea of the power of the former has probably arisen from not properly estimating the weakness of the objects demolished by them: they will, no doubt, when seconded by the plunging or other movement of a vessel, make havoc with her bulwarks, and sweep away her boats, the former being a comparatively feeble structure, and the latter light bodies

with a large surface, possessing no inertia to resist the stroke of the spray. The fact is, the crest of the deep-water wave, being broken into foam, and its strength diffused, has in reality very little of a 'ram-like' power: what effect, for example, has it upon the sharp bow of a steamer or other vessel advancing against it?—what against the Dutch fishing vessels, which ride at their anchors in all weathers, a service which was also performed by the tender employed in the North Sea Survey, without the slightest accident or damage? It follows, therefore, that the crest of a deep-water wave would be harmless in the case of a structure properly designed to resist it."

A very slight obstacle is sufficient to reduce the size of this miniature breaker, and even to destroy it. Admiral Bullock says he has often observed fishermen's nets cut off the crest of a deep-water wave, and produce comparative smooth water under their lee. Many boats driven off shore by gales of wind have been saved, with their crews, by riding under the lee of their spars formed into a raft, over which the surface drift or crest has fallen and expended itself, thereby placing the boat in a smooth. Major Parlby, in his evidence before the Select Committee on Shipwrecks in 1843, alluded to the effects on the surface breaker of ocean waves at the Cape of Good Hope produced by the seaweed *Laminaria buxinalis*, which grows in a tubular form in lengths of 20 or 30 feet or more—the upper end is trumpet-shaped, and floats on the surface, while the lower end is attached to rocks at the bottom. But one of the most marked effects is produced by oil. Fishermen have long been in the practice of towing a mass of greasy garbage astern of their boats to cut off and destroy a following sea. Dr. Franklin suggested "the pouring of oil on the sea to still the waves in a storm." "The foundering of the screw-steamer *William Becket*, of Goole, off the Scaw, on the 12th of November, 1856, is," says Mr. Calver, "another case in point, for the escape of her crew in the boats, through a heavy sea, was solely due to the use of oil. Dutch fishermen often resort to the same means when running in their vessels before a heavy sea, and a gentleman at Scarborough mentioned to the writer, that he had often seen them do it in entering the harbour there in heavy weather, and that the effect produced upon the water by the diffusion of the oil was quite magical; the following crests were completely cut off, and a broad and smooth wake established behind the vessel. No doubt the same process might be made use of to insure the safe beaching of life-boats." The above interesting facts are of great practical importance, for they show that the wave-crests may be readily reduced by apparently trifling means. It is also necessary to observe, that, as this feature is caused by the wind, it requires space before it can gain fresh volume when it has once been broken and destroyed; it requires time, in fact, before the wind can form the miniature wave afresh. It may therefore be accepted, doubtless, as a fact, that, when once broken, no surface-drift, of any practical importance, could form in the limited space afforded by a refuge harbour.

The deep-water undulation may be intercepted, reversed, reduced, retarded, redirected, and destroyed, the qualifying elements being the tides, or the friction arising from the bottom or from the margin of the sea. When they advance from deep water upon a rocky and steep line of coast, each undulation, on reaching the face of the cliff or other obstruction, becomes piled or heaped up, and then, falling by the force of gravity, assumes the form of another wave, which, retiring seaward in a direction opposite to that of the initial wave, opposes and materially reduces in height that arriving next in succession. "The useful lesson to be learnt from this is," says the author, "that a deep-water undulation, before it can reach an upright barrier, must have become reduced in height—in fact, partially destroyed; and, from the numerous instances of recoil observed by the writer, he has no reason to suppose such reduction to amount to less than one-third of the initial height of the wave." The undulation, from being susceptible of friction also, is influenced by the depth of water and the form of the shore upon which it is advancing. As the waves arrive in shoaler water, and feel the effect of the bottom, they become lower and shorter, their crests are more broken, and the bottom has the effect of partially "tripping them up." The deep-water undulation is also quickly destroyed by an expanse. When, for instance, its continuity has been broken by the interception of an artificial work, and the detached portion arrives at an expanse, it quickly subsides and becomes lost. An instructive instance of the sort is afforded by Sunderland Harbour, where the heaviest seas fall in height directly they arrive at the beaching ground or stilling basin, an expanse about 800 feet within the pier-heads, and they become altogether subdued in a further distance of 200 or 300 feet.

In shoal water, the wave is no longer a simple undulation; it there becomes a wave of translation, the water forming it acquires progressive motion, which motion eventually imparts to the breaker percussive force. As the depth decreases and friction in-

creases, the wave becomes shorter; "its front-incline becomes steeper than the rear-incline, and more and more approaching a perpendicular, until at length the crest, which is being impelled forward at a greater rate than the foot, overhangs, and then falls with tremendous force upon the shore or other object opposing its advance. It matters not whether the friction which causes the breaker be that of the bottom, or of an artificial work presenting the same profile."—(P. 13.)

The breaker, being a weighty body of water, falling over and thrown forward with a velocity little less than the wave had as an undulation, naturally acts with enormous force. The vessel which meets and opposes the deep-water crests unharmed is quickly battered and shivered to pieces by the breaker, which will at times level rocks, as well as sweep away artificial works opposed to their course.

(To be continued.)

THE ATLANTIC TELEGRAPH.

Despite all our fears and prophecies the Atlantic cable has been safely extended between England and America! The announcement positively savours of the miraculous; and no man who has acquainted himself with the difficulties of the enterprise can fail to see in its completion abundant cause to admire the spirit, the constancy, and the stout-heartedness of Mr. Bright and his colleagues. Whatever defects in the working capabilities of the cable may hereafter be discovered, the fact that the cable is laid, and that electric communication exists between this country and the American continent, demands our unrestrained homage. It was a source of regret to us that the news did not reach here in time to enable us to announce it in our last Number. An eye-witness gives the following account of the progress of the enterprise.

The *Valorous* and *Niagara* met at the rendezvous (lat. 52° 5′ N., long. 32° 42′ W.) on the morning of the 26th. The *Gorgon* arrived on the 27th, and towards the evening of the 28th the *Agamemnon* was descried in the distance. On the 29th of July the "splice" was effected on board the *Agamemnon*, between the hours of 12 and 1, and the cable that was to unite two hemispheres was consigned to the mighty deep, and, the hawser that connected the two steamers being slipped, the *Agamemnon* and *Niagara* steamed eastward and westward to their respective destinations, convoyed by the *Valorous* and *Gorgon*. The arrangement was, that, if a rupture should occur when less than 150 nautical miles of cable had been paid out, the squadron should return to the rendezvous; but, should each vessel succeed in paying out 150, the orders were understood to be to return to Queenstown. It may well be conceived with what anxiety every human being in the squadron looked out for the signal that was to relieve them from the monotony of cruising near and around an unseen rendezvous in the middle of the Atlantic, losing their summer and their patience in what former experience had told them was almost a hopeless experiment. About 2 p.m. on the 30th the *Agamemnon* signalized that 150 nautical miles had been paid out by her, and about 4 p.m. she again signalized that the *Niagara* had done the same.

The following is a tabular view of the daily progress of the experiment, which will give more minute and accurate information than a connected narrative.

Date and Time.	Miles of Cable paid out by *Niagara*.	Miles of Cable paid out and Miles of Distance run by *Agamemnon*.	Percentage of Cable paid out over distance run in last and in whole distance.	Depth of Sea in Fathoms.	Latitude, Longitude, and Distance to Valentia.
July 29—1 p.m.	...	...	...	1550	52° 8′ N.
July 30—8 p.m.	...	26	...		32° 27′ W.
8 a.m.	...	110	39¼		816
		79	39¼		
Noon.	126	136	18	2000	52° 24′ N.
		101	34½		29° 50′ W.
8 p.m.	180	180	31½		721
		134¼	33¾		
July 31—8 a.m.	250	250	27¾		
		189¼	31½		
Noon.	282	282	48¾	2200	52° 33′ N.
		211	33¼		26° 44′ W.
8 p.m.	...	330	18¼		606
		251¼	31¼		
Aug. 1—8 a.m.	420	410	16¾		
		320	28		
Noon.	440	434	33½	1950	52° 27′ N.
		338	28½		23° 16′ W.
8 p.m.	500	492	41¼		476
		379	29¾		
Aug. 2—8 a.m.	580	575	36		
		442	31		
Noon.	610	605	36¼	1880	52° 35′ N.
		465	30		19° 48′ W.
8 p.m.	670	690	22½		346
		510	29¾		
Aug. 3—8 a.m.	750	744	20¾		
		579¼	28¼		
Noon.	780	770	26¾	1900	52° 27′ N.
		600	28¾		16° 7′ W.
8 p.m.	820	824	22½		214
		644	27¾		
Aug. 4—8 a.m.	900	900	13½		
		711	26¼		
Noon.	920	924	33¼	415	52° 11′ N.
		729	26¾		12° 47′ W.
8 p.m.	962	970	24½	210	89½
		771	9¾		
Aug. 4—4 a.m.	1,010	1,004	24	30	—
		808	6		

REMARKS.

July 29.—Cable spliced in lat. 52° 9' N., long. 32° 27' W. Distance to Valentia 816* miles.

7·30.—*Agamemnon* stopped for two hours to splice cable, having found a defective place in it.

July 30.—*Niagara* shifted from one coil to another at 5 a.m. Strain on *Agamemnon's* cable 1,800 lbs.

2·30 p.m.—*Agamemnon* had paid out 150 miles of cable.

3·30 p.m.—*Niagara* had paid out 150 miles.

Agamemnon lost sight of *Valorous* from 11 p.m. to 11·30.

During the night motion of ship extremely dangerous to cable.

July 31.—Noon.—Barometer falling.

8 p.m.—Very threatening appearance of weather.

Aug. 1.—4 a.m.—Barometer fallen to 29·55 in.

Noon.—Barometer steady, weather unsettled.

8 p.m.—Motion of ship very dangerous to cable.

Aug. 2.—8 a.m.—During the night continuity ceased for 10 minutes, but was afterwards very good.

Noon.—Barometer rising, weather improving.

3·15 p.m.—Cable seriously endangered by an American schooner passing close astern of *Agamemnon*.

Aug. 3.—3 a.m.—An American ship passing near *Agamemnon* was compelled to heave to until the latter had passed.

7 p.m.—*Agamemnon* supposed to have arrived in shallower water, strain on the cable (by dynamometer) having considerably decreased—viz., to about 1,000 lbs.

Aug. 4.—4 a.m.—*Agamemnon* changed to last coil of cable.

Noon.—Proceeding slowly, so as not to close the land before daylight on the morning of the 5th.

3 p.m.—Several whales near *Agamemnon*.

8 p.m.—*Valorous* went ahead to make the land, and sighted the Valentia light at 9·45 p.m., and returned to *Agamemnon*.

Aug. 5.—5·30 a.m.—*Valorous* anchored at Valentia (inner part of Doulus Bay).

6 p.m.—*Agamemnon* anchored in the same place. *Niagara* proceeding up Trinity Bay.

Electric current complete.

PURIFICATION OF THE THAMES.

THE following letter has been addressed to Mr. Coningham, M.P. for Brighton, by Mr. F. O. Ward, a member of the late Metropolitan Commission of Sewers, well known for his strenuous and successful advocacy of the tubular system of town drainage, and of the corresponding tubular arrangement for applying town sewage to fertilize the land. Mr. Ward has carried that system against strong opposition, and he now proposes its extension to effect the purification of the Thames by diverting the sewage from the rain brooks, which are its tributaries, and the pollution of which, as he points out, involves as a necessary consequence the fouling of the main stream. Mr. Ward's principle, "THE WHOLE OF THE RAINFALL IS DUE TO THE RIVER, THE WHOLE OF THE SEWAGE TO THE SOIL," has our entire concurrence; and we believe that, at the present juncture, our readers will be glad to have before them the views of this eminent sanitary reformer, whose letter we accordingly publish *in extenso*.

"6, Hertford-street, Mayfair.

"My dear Coningham,—In compliance with your request I will shortly state some principles which, in my judgment, are essential to the efficiency of any scheme for the purification of the Thames.

"In the first place I would remind you, that to throw away the ammonia and phosphorus of the London sewage is virtually to throw away bread. Town sewage, which many engineers look upon as refuse to be discharged, I regard as property to be administered. The proper outfall for the London sewage is not this or that point of the river or of the sea, but a suitable tract of land growing exhausting crops. Fifty farms of 1,000 acres each might be raised in value at least £10 per acre per annum by irrigation with the London sewage. This would produce £500,000 per annum, equivalent, at five per cent., to £10,000,000 of capital. This ought not to be thrown into the sea.

"In the next place I would point out that, just as, on the one hand, the sewage proper should be carefully diverted *from* the Thames, just so, on the other hand, should the rainfall be carefully directed *to* the Thames, to aid its scour, which suffers by every drop withdrawn. To divert a rain-brook is to mutilate a river. And every extension of an intercepting system having the amputation of tributaries for its object and effect must progressively impoverish the main stream. So that, were the Thames to be 'purified' on this plan from end to end, it would be pruned of all its branches; and its whole fresh-water stream would be diverted into the intercepting tunnels. The tidal estuary would remain, but the *river* would cease to exist. Its channel would be free from sewage, no doubt, but it would also be free from water; and the perfection of purity would correspond to the moment of abolition. This is not what we want; we want a river running pure, but also flowing full.

"Hence, it appears that sewage and rainfall, though valuable when separate, the one to fertilize land, the other to scour streams, are rendered worthless by admixture. Each spoils the other—sewage rainfall by pollution—rainfall sewage by dilution. The mixed mass is too vast and variable for economical distribution over fields, too foul and fœtid for advantageous delivery down streams.

"On this point it is worth while to dwell, for it is the key of the problem.

"The London sewage proper consists of

* Distance by plain sailing about 811 by the great circle.

the (say) 50,000,000 gallons which the water companies pump daily into the town, enriched with the residuary matter which this water takes up in its passage through the dwellings of the population. The average weight of residuum (excluding moisture) yielded to the sewage by each man, woman, and child, is 2 ounces per diem; or, for the 2½ million inhabitants of London, 139 tons per diem, containing, at 17 per cent., 23½ tons of nitrogen, equal to 28½ tons of ammonia; which ammonia, at 6d. per lb., is worth £1,597. The weight of the pipe-water thus enriched,—in other words, of the daily sewage proper, is, in round numbers, only 223,000 tons; about as much as a heavy shower of rain throws down on 2,000 acres of land. This small and uniform daily sewage-flow would require only a couple of moderate-sized sewers (instead of several colossal tunnels) to convey it away; and, if necessary, it could be pumped this way or that by steam power, as easily as a lady pours tea into this or that cup at her pleasure.

"Turn now to the rainfall, and consider the contrast it presents, in this respect, to the sewage.

"The rainfall on the London drainage area, taking this at only 59½ square miles, and making ample allowance for evaporation and absorption, may yield to the sewers some 80 or 90 million tons annually; a total which may be taken as about equal to the annual total of sewage. If, therefore, the rain drizzled down uniformly all the year through, so as to afford, like the sewage, a regular daily supply, it could be mastered, like sewage, without difficulty. This, however, as we all know, is not the case. The whole of the rain falls on 152 days of the year; and of the annual 24 inches, 16 fall in 44 days—or two-thirds of the rain in about one-eighth of the days. On one day in twelve throughout the year the rainfall is to the sewage of London as 4¾ to 1; on a smaller number of days (about 10 in each year) the proportion of rainfall to sewage is as 9½ to 1; and on some few occasions annually it is as 19 to 1, and upwards. This disproportion is rendered still greater by the fact that the rainfall assigned to each rainday is not really diffused over twenty-four hours of time, but nearly always descends in a fractional portion thereof; so that, for example, seven million tons of rain, equal to more than a month's sewage, sometimes fall on London in a single hour. The mixed streams of rainfall and sewage, liable to be thus suddenly swollen, exceed the capacity of any tunnels that can be built for their diversion from the river, and would overpower any mechanism at our disposal for their distribution upon the soil. The great brook-sewers already existing, and the great rain-and-sewage tunnels which it is proposed to build for their interception, are equally open to this objection—that their current, on rainy days torrential, must needs shrink in dry weather to a slender streamlet, too weak to scour the containing culvert so as to prevent the accumulation of putrescent deposit.

"Reflect now, for a moment, how this fact of accumulation—of stagnancy instead of circulation—changes all the conditions of the problem. The daily dry fæcal discharge from London amounts only, as we have already seen, to 139 tons; a comparatively insignificant quantity if delivered as fast as produced. But, instead of taking measures to secure for London this regular diurnal evacuation, we keep, on the most moderate estimate, at least twelve months' *excreta* constantly stagnating underground as deposit in the cesspools and sewers. The mass of putridity thus constantly retained in subterranean London actually equals one day's evacuation of the whole population of Europe and Asia, numbering 800 millions. The figure is a startling one, and the fact still more so; but a simple calculation proves it true: for the number of the London population, multiplied by 365, gives a product exceeding 800 millions.

"Now consider the effect of a sudden rain-storm falling on London, and pouring through these overcharged subterranean receptacles. Suppose it only to sweep into the river nine or ten days' accumulation of filth, to what do you imagine that is equivalent? It is equivalent to the simultaneous discharge into the river Thames of the mass of excrement produced in one day by the entire population of Great Britain, numbering twenty-one millions. And to such eruptions of filth we should still be frequently liable, even if the great tunnels for mixed rainfall and sewage were built. The money loss on every such occasion would be, in ammonia only, without reckoning phosphorus, nearly £16,000. Besides, after every such discharge, the tidal river would remain discoloured, and in hot weather putrescent, for several days. Such would be the operation of the colossal tunnels on which we are invited to lay out millions; such are the evils consequent on the mingling of rainfall with sewage.

"The obvious conclusion is, that the tunnel scheme propounded by the Metropolitan Board of Works, with the sanction of Mr. Stephenson and his party, not merely ignores one half of the problem in hand, viz., the agricultural utilization of the sewage, but is inadequate to accomplish the moiety which alone it contemplates, viz., the purification of the river.

"Indeed, by their last vote on this subject, the Metropolitan Board resolved to pour the sewage of the western district of London, more or less deodorized, into the Thames above Westminster-bridge, and to reserve the proposed great tunnels for the conveyance of the remaining sewage only. Of deodorization, the mainstay of this scheme, I will only here remark that, while at best it is a costly and imperfect palliative, it becomes quite impracticable precisely when most needed, *i. e.*, when heavy showers are sweeping from the sewers the largest masses of putrescent filth. Independently, however, of this objection, the two parts of the scheme are manifestly inconsistent. For, if deodorization suffices for the west, why is interception necessary for the east? And, contrariwise, if miles of tunnel are required to convey far off the eastern sewage, how can it be right to pour the western sewage into the river above bridge? Surely the principle must be false that leads to such illogical conclusions.

"The principle to which, by these and other considerations, my friends and I have been gradually led, is shortly this—that THE WHOLE OF THE RAINFALL IS DUE TO THE RIVER, THE WHOLE OF THE SEWAGE TO THE SOIL.

"The adoption of this principle is, we believe, as essential for the perfect purification of the Thames, as it is for the economical utilization of the sewage.

"That this may be obvious, keep in view that, when sewage and rainfall are once mixed, whether in the Thames itself or in the minutest of the filaments that feed it, (in a street sewer or in a house drain, for example), those mingled waters can never again be separated. In polluting the smallest of its tributaries, you virtually pollute the Thames; and, as it has been said, 'Take care of the pence, and the pounds will take care of themselves,' so I venture to say, 'Purify the tributaries, and the main stream will run pure of itself.'

"If, now, we trace in each house the course of the rain from roof and area, and the course of the sewage from closet and sink, till we come to the point at which the separate pipes conveying these two distinct streams meet in a single drain, we arrive at the precise boundary line between possible and impossible in this matter of Thames purification and sewage utilization. For, up to this point, and before this meeting of two waters, we are free to apply each streamlet to its proper use. We can send the unpolluted rainfall to scour the river, and the undiluted sewage to fertilize the land. But directly this junction point is passed, directly the daily runlet of cistern-water, rich with its freight of ammonia and phosphorus, meets and mingles with the casual rainfall, the two waters become, as we have seen, a worthless, unmanageable mixture, equally unfit for agricultural and urban use. Not only do they cease to be our property, and pass beyond the control of art, but they revert to the domain of nature, spoiled even for her simple service. For this error we are punished by pestilence.

"I say, therefore, that the battle of Interception is to be fought, not on the banks of the river, but in the basements of the houses; not with monstrous tunnels, but with modest tubes; not by the diversion of variable rain-brooks, alternately dry and torrential, but by the diversion of uniform cistern supplies, always moderate and manageable; not at a profitless cost of many millions, yielding no return, but at a profitable outlay of few millions, producing an ample return,—probably half a million per annum.

"This Tubular purification of rivers, and fertilization of lands, is indeed but the logical extension of the Tubular drainage of houses and streets, which my friends and I have succeeded in establishing after a ten-years' struggle with the engineers. And as our Tubular sewers, notwithstanding the strenuous opposition of Mr. Stephenson and his friends, are now working successfully by hundreds of miles, not only in provincial towns, but in the metropolis itself; so also, I am confident, will the Tubular Purification of the Thames ultimately supersede the monstrous Tunnel project, which, if adopted, would cost us many millions, and turn out a gigantic failure after all.

"You will observe that, in this short note, I have confined myself to the summary indication of a few broad principles; abstaining purposely from the premature development of a specific plan for their realization. My name has indeed been attached, without my sanction, to plans and calculations which have been widely circulated, ostensibly to illustrate, but really to discredit, the principles which I advocate. It has even been asserted that the realization of those principles would involve the tearing up of every basement in London, the re-construction in duplicate of the drains from back to front of every house, and from end to end of every street,—with other equally preposterous extravagancies. Such conclusions are not mine, and they argue only poverty of invention on the part of those who can imagine no simpler means of carrying my views into effect.

"I have only to add, in conclusion, that the purification of rivers and the utilization of sewage are, in my judgment, but

two aspects or incidents of a sanitary organization, comprising several other elements, each indispensable to the perfect working of the whole. The complete organization cannot, however, be suddenly accomplished; nor can even its several parts be simultaneously prepared. But, in the development of such portions as we may be able presently to undertake, the others may be kept in view. And this is in the highest degree desirable, in order that the sanitary works of our day may serve, not as a bar, but as a transition, to the more perfect institutions of our successors. Should the monstrous rain-and-sewage tunnels proposed by the Metropolitan Board be built, they would indeed oppose a serious obstacle to such ulterior progress. But of this I have little fear. Those subterranean rivers are already beginning to be regarded by the ratepayers as a costly and colossal blunder; and, unless I am much mistaken, they will be obsolete before they are begun.

"I remain, my dear Coningham,

"Faithfully yours,

"F. O. Ward.

"W. Coningham, Esq., M.P."

THE DRAINAGE OF LONDON.

A PROPOSAL FOR A SELF-ACTING SEWAGE SYSTEM, FOR RESTORING THE PURITY OF THE RIVER THAMES.

By Mr. J. Stenson, C.E. and Ironmaster, of Northampton.

The conditions for improving the state of the river should be such as to secure efficiency of action, durability of materials, simplicity in construction, and economy in its operations; to divert the sewage from its present course and to provide new channels for its conveyance to the sea, and by a system which admits either of the deodorization of the sewage, for the purpose of utilizing its contents, or of conveying the whole of it to a point in the river too low down in the stream for the returning tide to bring back again.

It is proposed that two sewage mains should be laid, one on each side of the river, but within the margin of its banks; and, as these mains would be duplicates of each other, a description of one of them will answer for both.

The main is to be constructed of plate iron and riveted together in the manner of boiler plates; its form to be rectangular in section. This main is to have its lower end or outlet, say, below Gravesend, and its upper end, or inlet, at Battersea, or thereabouts. The whole of the sewers now discharging into the Thames are to be made to discharge into this main, their connexions with the main being cylinders of plate iron, and hermetically connected at their junctions with the main, and at which junctions sluice-valves are to be provided, and so arranged as to be opened and closed when required. The inlet and the outlet openings at the ends of the main are to be also provided with sluice-valves, which shall also be opened and closed at suitable periods. It is proposed that the whole of these valves shall be opened and closed by the action of the tides, and be thus rendered self-acting, so as to ensure a uniformity of action, and also to obviate the costs attendant on the use of steam machinery. The upper end of a main is to open into a reservoir, which is to be filled by the rising tides, and, when full, to remain so until low water, or nearly so, when the water in this reservoir shall be used for flushing the main, thus carrying off the sedimentary matters which the sewers may have deposited therein.

It is also proposed that the reservoir for the purpose of flushing the main shall be constructed of plate iron, but of greater width and depth than the main; the base or floor of the reservoir to be level with that of the main, but the side walls to be of such height as to be above high water at spring tides; this reservoir is to have a covering similar to that of the mains, its cover being provided, however, with air pipes at intervals along its length. This reservoir would be somewhat of the same form as one of the tubes of the Britannia bridge, but having one of its ends closely and permanently stopped, while the other is provided with a valve, which, as before mentioned, is to communicate with the upper end of the main.

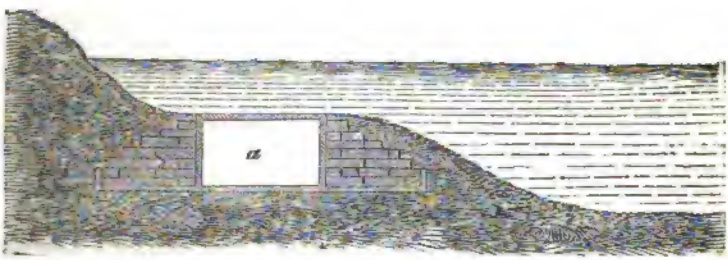
As it is necessary that the rising tide shall have free access to the interior of the reservoir, the vertical plates on the side facing the river are to be perforated with a series of apertures (each to have an area of six or eight feet), at intervals throughout its length, each aperture to be provided with a valve opening inwards, and which, though admitting a free ingress to the rising tide, shall, at high water, close by its own gravity and prevent its escape during the ebbing of the tide.

The working of the system now proposed is to be as follows:—Let us suppose it to be low water, and the valves at both ends of the main to be closed; the valves covering the inlet apertures of the reservoir to be also closed, as they will be by means of their own gravity, and the sluice-valves at the junctions of the sewers with the main to be open. It will be seen that the

tide may rise along the natural channel of the river (and also fill the reservoir), but without entering the main, which is now receiving the sewage from all the drains connected with it. Immediately on the tide reaching high water, the valves in the side plates of the reservoirs will close, and retain the water which had entered through them, reserving it until low water, or nearly so, when the valves at the junctions of the sewers with the main shall be closed for a short time; the valve at the outlet end of the main shall now be opened, and the valve at the upper end of the main at Battersea shall also be opened; the whole of the water now contained in the reservoir (which may be half a mile in length) will immediately rush into the main, with a force due to the difference between the level of high and low water, thus effectually flushing the main with clear river water; and, as but a short time would be necessary for emptying the reservoir, the valves at the ends of the main are now to be closed, and those at the junction of the sewers with the main are to be opened, and are to remain so until the next low water, when the flushing of the main would be again effected, and so on, repeating its action by the periodical receding of the tides.

It is further proposed that the valves at the ends of the main, and also those of the sewers, shall be placed in connexion with pontoons, which, by their floatage, shall be so adjusted as to open and close the valves at the times best adapted for the correct performance of the whole, and thus to render the system automatic in its operations.

It would, of course, be necessary to so ballast the mains as to prevent their floatage during the rising of the tides. A plan for doing this is shown in the annexed engraving.



A shows the end section of the main, the bottom plates being continued beyond the vertical sides, and forming a floor on which to place the necessary ballast at alternate distances throughout its entire length, leaving spaces for inlets of sewage (by means of iron tubular connexions) where required.
B,B show the position of ballast, affording also some protection to the main.

In case of adopting a deodorizing process, suitable provision may easily be made by adding side branches to the main, at any point below London where it may be desirable to establish the works; or the main may be entirely diverted from the river for that purpose. The reservoir suggested for flushing the main may be either left out of use altogether (which I think, however, to be very undesirable), or only as much water used as may be found necessary for preventing an accumulation of sedimentary matter in the main; or the flushing may be accomplished at spring tides only, when its efficiency will be greater in proportion to the increase of its fall. If the latter be adopted (and I think, in case of deodorizing, it will be found preferable), then there would be no more water enter the deodorizing cisterns than the quantity usually delivered in combination with the sewage of the ordinary drains; and, in case of flushing the main, say, at spring tides, the sewage, including such large excess of water, could be thrown into the river, and thus, for one tide only in every twenty-eight, find its way to the sea.

An Anticipation of the Electric Telegraph.—The *Spectator*, No. 241, Dec. 6, 1711, describes a mode of communication resembling that of the present day by means of the electric wire. It tells us that Strada, in one of his prolusions, gives an account of a chimerical correspondence between two friends by the help of a certain loadstone. If this loadstone touched two needles, when one began to move the other, though at never so great a distance, moved at the same time and in the same manner. The two friends, being each possessed of one of these needles, made a kind of dial-plate, inscribed it with the four and twenty letters. When they were a hundred miles asunder, if one had a mind to write to his friend he directed his needle to every letter that formed the words. The friend, in the meanwhile, saw his own sympathetic needle moving of itself to every letter which that of his correspondent pointed at. By this means they talked together across a whole continent, and conveyed their thoughts to one another in an instant over cities or mountains, seas or deserts.

TRIALS OF SHIPS' PUMPS.

Several trials of the new ship's pump invented by Mr. Roberts, of Millwall, have recently taken place at Woolwich Dockyard, simultaneously with similar trials of the Downton pump now extensively used in the Royal Navy. The results of these competitive trials, which were uniformly in favour of the new pump, have from time to time been brought to our knowledge; but, as Mr. J. Stone, of Deptford, the maker of Downton's pumps, has continually applied for further tests, thus postponing the final decision, we have refrained from publishing these results. On Friday last, the Downton pump having been specially fitted with 4-inch suction pipes and delivery, and thus changed from its ordinary form, a further trial was made under the superintendence of Mr. James Peake, the Assistant Master Shipwright of Woolwich Dockyard, who has throughout evinced a spirit of fairness and impartiality. On this occasion, for the first time, the advantage gained was in favour of the Downton pump. Our practical readers, knowing that when pumps are worked by hand it is very possible to secure at times an extra amount of exertion on the part of the men working them, will not be disposed to over-estimate this exceptional advantage; especially when they learn that Roberts's pump was worked so badly that eight men at one time did no more than six at another. An apparent superiority having once been gained, however, the Woolwich naval correspondent of the *Times* was duly primed—somewhat absurdly so, as the *Times*' people often are—and on Saturday, in the Naval and Military Intelligence of that paper it was announced that Downton's "portable ship's pump," "notwithstanding its inferiority in size, was pronounced to be 85 per cent. superior in effect." On Monday, under the same heading, the following paragraph appeared:—"We are requested by Mr. J. Stone, of Deptford, to insert the following, in reference to the notice of the trials of Downton's and Roberts's pumps at Woolwich Dockyard, in the *Times* of Saturday:—'I, as the maker of Downton's pumps for Her Majesty's navy, and consequently of the one used for the trials, beg to state that in your report 'portable ships' pumps' should read, 'main ships' pumps;' and 'throughout the trials, Downton's pump, notwithstanding its inferiority in size, was pronounced to be 85 per cent. superior in effect,' should read, 'Downton's pump, notwithstanding its inferiority in size or capacity of 60 per cent., threw 25 per cent. more water than Roberts's, which, together with the difference in size above stated, gave a result of 85 per cent. in favour of Downton's.'"

This talk about "85 per cent." is, manifestly, nonsense. The only way to measure the relative efficiency of pumps is, of course, to compare the power applied with the water thrown; questions of size or capacity, cost, portability, &c., form quite different subjects of consideration.

The following statement, which Mr. Roberts has sent to the *Times* as well as to ourselves, contains his corrections of the misstatements which have appeared:—

"My pump is pretty accurately described; Downton's is what is technically known as a three-throw pump—that is, having three buckets working one above the other, the cranks being 2½ ins. Each bucket has a lift of 5 ins., but, as during a portion of the stroke two buckets are lifting together, the effective stroke is only 4⅜ ins. each, or 13⅛ ins. together, say 13 ins., giving an area of 826·93 ins., or 12½ instead of 60 per cent. less capacity than mine. This is theoretical capacity.

"On the 19th of June, when the pumps were first fixed, a 300-gallon tank was filled by my pump in 1 minute 50 seconds, with 82 revolutions, and Downton's filled it in 2 minutes 25 seconds, and 106 revolutions, or about 25 per cent. This is about what it ought to be, as no allowance was made in the above calculations for piston rods, &c.

"On the 21st of June the trial to fill and empty the tanks took place, with the following result:—My pump, with six men, filled three tanks in 5 minutes 15 seconds, with 240 revolutions, or 171¼ gallons per minute; and Downton filled them with the same number of men in 6 minutes and 308 revolutions, or 150 gallons per minute. The next trial to pump out the tanks gave a result of 171·58 gallons per minute to me and 148·47 to Downton, or 22 gallons per minute in my favour.

"The next trial was to take the pumps to pieces in case of their getting choked. Mine was to pieces and in working order again, and the water fetched, in 1 minute 50 seconds; but Downton's was not ready at the end of 10 minutes.

"During the above trials both pumps were fitted with three and a-half suction hose and delivery, but now Mr. Stone asked leave to fit larger suction pipes. This was granted. He then fitted Downton's pump with 4-ins. suction pipes and delivery, my pump remaining as it was on the former trial. This brings us to yesterday, when the trial was only to see which could throw most water with a free delivery, and also what difference the large pipes would make at the first trial, with six men to each. At the end of 15 minutes Downton had

gained ⅞ of an inch during this trial, the men did not get above 42 revolutions per minute out of my pump, nearly five less than on the last trial; on the second trial he only gained ⅛, and on the third 3-16ths of an inch, so that the two extra men were of no service to me, although, when we tried the two pumps with ten men each a few weeks back, mine was 50 per cent. better than the other. The above three trials were all that took place yesterday, occupying 40 minutes, exclusive of breathing time.

"I also beg to inform you that the Downton pump tried is not a portable pump; when fixed it must remain; it cannot be removed and put into the ship's boat, and converted into a floating engine; but mine can in about a quarter of an hour. My pump can also be converted into a syphon within a minute, and the ship filled with water without pumping at all.

"Again, the *Times*' correspondent says that several preceding trials have taken place with the like result, exhibiting the superiority of the old pump. By referring to the accompanying statement of trials on board the *Fisgard* you will find quite the reverse to be the fact. On the first trial the result was 103¼ gallons to me, against 80 to Downton; in the second it was 96 to 54¼; in the third, 106¾ to 67¾; in the fourth, 100 to 80 gallons per minute; in taking them to pieces, &c., it was 1½ against 20 minutes. Then, as a fire engine on board ship, with six men each, Downton's only threw the water over the foreyard, and mine threw it over the topsailyard 68 ft., at least 16 ft. higher than Downton's. Then, when my pump was put into the boat and 16 men put to it, the water was thrown above 83 ft. high, and it was returned to its place in 10 minutes, Downton's not being able to be moved at all.

"William Roberts,
"Foreman
to Messrs. Brown, Lenox, and Co.
"Chain Cable and Anchor Works, Millwall,
"Poplar, London, Aug. 7."

The 5½-ins. pump mentioned above is now fitted on board H.M. screw store ship *Industry*, and was tried as a syphon on Monday last, the 9th inst., the ship then having 4 ins. water in the hold. The plug being placed in proper position, and six strokes of the pump given to exhaust the air, it was found that in five minutes the water had risen to 11½ ins., or the water had risen in the ship's hold 7½ ins. in five minutes without pumping at all. The value of an apparatus of this kind will be at once seen, when the facility with which cargoes on fire in the holds of vessels could be extinguished by means of it is considered.

CAPTAIN KYNASTON'S PATENT SLIP OR DISENGAGING HOOK.

It affords us much pleasure to state that the patent slip or disengaging hook invented by Captain Kynaston, C.B., of the Royal Navy, and described as applied to the lowering of boats in our last volume, is becoming properly appreciated by naval officers and the Admiralty authorities. Captain Robinson, of H.M.S. *Exmouth*, the officer in charge of the steam reserve at Devonport, having been ordered to examine and test the invention, has reported most favourably upon it. We are not in a position to lay his report before our readers, in consequence of the jealous and almost superstitious secresy observed in connection with the official documents of the Admiralty; but we are able to state the nature of the experiments made by Captain Robinson, and their results. In the first place, a quarter boat belonging to the *Exmouth* was lowered repeatedly at her moorings, and the disengagement of the same was effected instantaneously. Great facility was experienced in hooking on and in handling the blocks fitted with the disengaging hook. In the next place, a gig, fitted with Captain Kynaston's hook, was repeatedly lowered from the *Lark* gunboat, at full speed, both when going ahead and also when going astern, and the disengagement was again instantaneous. Very great facility was also experienced on this occasion, as on the former, in hooking on the boat tackles. It appears desirable to many persons, that the controlling power in lowering a boat should be in-board, in order that the boat may, if necessary, at any period of her descent, be hoisted up again. This result is fully obtained with Captain Kynaston's hooks. The boat hangs by the tackles, is lowered away by them, and when the proper moment arrives is effectually and instantaneously freed from them. One important feature of Captain Robinson's report was, we believe, that, on taking the opinion of the boats' coxswains and crews generally, he found them unanimous as to the handiness and facility of hooking on with this hook, and their belief in its perfect safety and efficiency in letting go.

The fittings connected with Captain Kynaston's hook are so simple, and the additional weight and gear necessary so trifling, that they scarcely require to be mentioned.

We hope that every suitable facility will be afforded for the further carrying out of so useful an invention, and that this contrivance, which, though extremely simple, is capable of being rendered a great boon to seamen all over the world, may be

speedily and extensively adopted in both our royal and our mercantile navies.

CAPTAIN BLAKELY AND THE WAR DEPARTMENT.

(Concluded from p. 129.)

We shall state the remainder of the case between Captain Blakely and the War Department in the words of the former, who is very able to deal with the facts. If the heads of the War Department are determined to avoid his claim, they must employ cleverer counsellors than they have yet called to their aid.

"Having early in January, 1855, informed the Minister for War that I knew of a mode of constructing cannon whereby howitzers could be made large enough to bombard Sevastopol and Cronstadt without loss to the fleet engaged, and he having refused to refer my invention to any one but the Ordnance Select Committee, who had the year before decided against the use of very heavy guns at all, I was about," says Captain Blakely, "to let the matter drop, not having money available to make the necessary costly experiments, when I was informed that, if I secured a monopoly of manufacture by Letters Patent, I should find no difficulty in raising money to carry out the experiments. I obtained a patent, dated February 27th, 1855, for the following methods of constructing guns:—An inner tube of cast iron with another layer or layers of tubes, either of cast iron, of steel, or of wrought iron, driven or shrunk on it, or with wire coiled round it. An inner tube of steel with other tubes driven or shrunk on, or with wire or bar iron wound round the inner tube. My object was palpably not merely to obtain the difference of strength between wrought and cast iron, as the Select Committee imagines, for I mentioned cast-iron tubes forced over another cast-iron tube as one method, and wrought iron over a steel tube as another, in one of which methods I absolutely obtain increased strength by the use of a weaker material. Be that as it may, I without difficulty obtained £400 on the security of the patent. I made the necessary experiments with such success that the Ordnance Select Committee, which in June, 1855, thought my plan dangerous, in December, 1856, recommended experiments to be made with it at the country's expense.

"All practical men being convinced by the experiments already made, I wish to sell my patent, but find (much to my astonishment) that the law provides no means of enforcing it against a Government official. The reader will share my astonishment at this on perusing the following quotation from the patent granted to me by Her Most Gracious Majesty:—

"'We do, by these presents, for us, our heirs, and successors, grant unto the said Alexander T. Blakely, his executors, administrators, and assigns, that these, our letters patent, on the filing thereof, shall be in and by all things good, firm, valid, sufficient, and effectual in the law, according to the true intent and meaning thereof, and shall be taken, construed, and adjudged in the most favourable and beneficial sense for the best advantage of the said Alexander T. Blakely, his executors, administrators, and assigns, as well in all our Courts of Record as elsewhere, and by all and singular the officers and ministers whatsoever of us, our heirs, and successors, in our United Kingdom of Great Britain and Ireland, the Channel Islands, and Isle of Man, and amongst all and every the subjects of us, our heirs, and successors, whatever and wheresoever.'

"Before selling, it was necessary to find out if the Government would honestly acknowledge the patent. I accordingly asked for the payment of a royalty on some Lancaster guns which had been thrown aside as useless, but were strengthened on my patented plan immediately after my gun showed such wonderful endurance at Shoeburyness. I received the following reply:—

"'War Department, 5th February, 1856.

"'Sir,—With reference to your letter of the 9th ultimo, on the subject of strengthening guns by means of external rings, I am directed by Lord Panmure to state that it appears by a report from the Ordnance Committee, that "your mode of making a gun on this principle has totally failed, as all such guns must do when the sides are strengthened by means which cannot be applied to the breech, where the failure must always occur." It is further stated, "that the application of external rings to give additional strength cannot be considered a principle in itself," nor is the system by any means new, for by papers now before the Committee it appears that in the year 1852 an inventor proposed to strengthen guns by the application of rings of steel or wrought iron from the breech to the trunnions. This method was first brought under the notice of the Government by the same gentleman in 1807. If, therefore, the principle of strengthening guns by rings shrunk on, or otherwise, was known before you obtained your patent, and of which there is very conclusive evidence, it does not appear to Lord Panmure that you can fairly lay claim to any exclusive right to the invention.

"'I am, Sir, your obedient servant,

"'F. Peel.

"'Major Blakely, R.A.,
"'10, Bolton-street, Piccadilly.'"

"About this letter Mr. Montague Smith, Q.C., gave the following opinion:—'I am of opinion that a mere proposal to do that which forms the third part of Captain Blakely's specification would not vitiate his patent.* It is not, however, necessary that the thing should have been patented to destroy the validity of Captain Blakely's patent, but it must have gone beyond the domain of experiment, and the thing either publicly carried out and used, or a sufficient description—to enable it to be carried out and used—published. A mere proposal made to the Government would not interfere with the title of a subsequent inventor, and I think, therefore, that neither of the proposals referred to would interfere with Captain Blakely's patent.' I also showed Mr. Peel's letter to Mr. Aston, a barrister who has devoted much attention to the Patent Law. Mr. Aston wrote, 'I do not think that the letter in question discloses any valid objection to Captain Blakely's patent dated February 27th, 1855.'

"These opinions, evidently, are based on common-sense as well as law. Suppose a geologist, A, comes to a landowner in 1807, and tells him that his property is rich in minerals; that the landlord, after consulting his steward, pooh-poohs the idea; that Mr. Geologist A returns to the landlord in 1852, and again, but still vainly, tries to persuade him to dig for silver and lead; that in February, 1855, the landlord grants Mr. B a lease of his mineral property, *and receives a sum of money for that lease.* What would an English judge say in summing up, were this landlord to try to eject Mr. B, after pocketing his rent, on the plea that Mr. A had in 1807, and again in 1852, urged him to mine on his own account?

"The next question was: How to obtain redress? On this point Mr. Montague Smith gave the following opinion:—

"'I do not think Captain Blakely can by any legal measures force the Government to pay him for the use of his invention, neither can he take any proceedings against Colonel Wilmott to compel him to desist from making the mortars, if, in making them, he is acting as the officer of the Government. Captain Blakely may maintain an action against anybody who uses his invention for manufacturing on his own account, although he should sell to the Government.'

"I allowed the matter to rest, feeling confident that eventually, when the plan came to be acknowledged as not only good for strengthening old guns, but as enabling Great Britain to use cannon twenty times as formidable as any now made, I should be liberally rewarded by Her Most Gracious Majesty, advised by any Ministry in power. I would have awaited this result patiently but for the claim to my invention put forward for some unnamed person in the Report of the Ordnance Select Committee of January 15, 1858.

"If I now remained silent, this person, not knowing of my prior invention, might claim and receive the reward due to me. Accordingly, on the 9th of April, 1858, I wrote, requesting the Minister of War to refer the question of the *essential difference* between my plans and those mentioned by the Committee (see page 22 and following pages) to any competent person or persons, such as Professor Eaton Hodgkinson, Mr. W. H. Barlow, Colonel James, R.E., Professor Thompson, of Glasgow, Dr. Woolley, or Dr. Rankine. I enclosed copies of the letters from Sir Charles Fox, Mr. Longridge, and Dr. Hart (Appendix C, D, E), testifying to this *essential difference.* The following is the reply I received:—

"'War Office, S.W., April 23, 1858.

"'Sir,—I am directed by Secretary Major-General Peel to acknowledge the receipt of your letter of the 9th instant, and to inform you, that he is not of opinion that a reference to arbitration of the points at issue between yourself and the Ordnance Select Committee would lead to any advantageous results, and that he is consequently unable to accede to your wishes in this respect.

"'I am, Sir, your obedient servant,

"'HARDINGE.

"'Captain Blakely,
"'Army and Navy Club.'"

"It appears, then, that in England there is a person authorized to sell for the sum of about £150 a document called a Patent, making free use of Her Majesty's name, and containing the words quoted at page 38, but that those words have no meaning beyond the construction it may please any War-office clerk to put on them. Surely this should be rectified! No permanent injustice may result, but much temporary inconvenience is unavoidable, and justice is not certain.

"In my own individual case delay is merely annoying. The case is too clear for any official, even if inclined, to do me injustice."

It is unnecessary for us to add to these remarks. We have no doubt whatever as to the validity of Captain Blakely's claim; and if his system of strengthening and manufacturing guns be generally adopted his reward must, of necessity, follow.

* "The proposal was not in reality to do that which I patented. It was, to quote the official report, '*to place* steel rings on old guns.' My patent is to DRIVE one or more tubes over another tube. The *force* required is the *essence* of my system."—*Captain Blakely.*

THE LANCASTER RIFLE.

From all sides the testimony of military men is coming in in favour of the Lancaster rifle. Mr. Busk's opinion recently appeared in our columns, and now we learn from the newspapers that additional trials took place last week on the marshes near St. Mary's-creek, Chatham, for the purpose of still further testing the greatest amount of accuracy to be obtained in firing at long ranges with the Lancaster rifled musket and the Enfield rifle. The rifles used on the occasion were the Lancaster elliptical bored musket, the same as used by the men of the Royal and East India Company's Engineers, and the ordinary Enfield rifle in use by the troops of the Line and at the school of musketry, Hythe. The persons selected to make the trial were several non-commissioned officers belonging to the Royal Engineers and an equal number of non-commissioned officers chosen from the depôts of the East India Company's regiments attached to the 2nd battalion, each of whom had undergone a regular course of instruction in the theory and practice of the rifle. Twenty rounds of ball cartridge were supplied to each non-commissioned officer. The range selected commenced at 350 yards, which was gradually increased to 600 yards, and the result of the trial again proved most conclusively the superior accuracy of the Lancaster over the Enfield rifle, although the skill of the contending parties was as nearly as possible equal. The practice of the non-commissioned officers was allowed to be very good, the target at 500 and 600 yards being repeatedly struck, and the general accuracy of the firing such as to elicit unqualified admiration. At the termination of the trial it was ascertained that the non-commissioned officers of the Royal Engineers, with the Lancaster rifle, had gained the large number of 17 out of 20 "points," while the number of "points" made by the non-commissioned officers of the 2nd battalion, with the Enfield rifle, was only 13·88. The finest practice which took place during the trial was that by Colour-Sergeant Barrow, Royal Engineers, and Colour Sergeant Gosling, 52nd Light Infantry, each of whom made the astonishing number of 21 "points." A third trial with the Lancaster and Enfield rifles will take place between the Royal Engineers' non-commissioned officers and those of the 3rd battalion of Infantry at Chatham.

CRICKMER'S PROPOSED METHOD OF DRAINING LONDON.

Gentlemen,—I must confess that I see many things in the way of Mr. Crickmer's scheme proving successful.

In the first place, I should like it to be shown in what way the chalk and sand formations will discharge the fluid sinking through them "into the sea." It may rest upon clay and other impervious formations in such a way as eventually to reach the sea, but to lay it down that such would always be the case, is more than I fancy Mr. Crickmer can prove. The fluid would descend perpendicularly, and, unless it happened to light upon any non-porous and seaward-inclined strata, it is very improbable that any portion of it would ever reach the sea. Otherwise, it would most assuredly continue to sink until entirely absorbed.

But, even were this not the case, to say nothing of the poisoning of springs and wells by the introduction of such a method, there is one consideration which must, I imagine, at once convince Mr. Crickmer that his plan is fraught with much danger. Assuming, for his benefit, that there are no underground cavities through which the liquid would pass, it would, I imagine, create some, on account of the want of tenacity which sand especially has, and, knowing the effect of the pressure of a column of fluid upon a large mass, the practicability of his scheme is at once overthrown. It may be asserted that the body of liquid could escape, and that sufficiently soon to prevent danger, through the sides of the cavity, but this must be satisfactorily shown before the plan is approved of, supposing it allowed that cavities might be formed, or natural ones met with. With regard to the rapidity of escape in such a case, let us consider that the sides of the cavity would be lined with a crust of slime, derived from the nauseous fluid, which would, of course, diminish the rapidity of escape.

On the whole, then, I imagine that your correspondent's scheme is, at first sight, plausible, but that, like a bad picture, it will not bear "looking into."

I am, Gentlemen, yours, &c.,

J. A. Davies.

August 7, 1858.

Board of Works.—The Metropolitan Board of Works have decided upon carrying out Mr. Bazalgette's system of Interception in draining London.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

REEVES, C. *Improvements in repeating or revolving fire-arms.* Dated Dec. 23, 1857. (No. 3156.)

This invention cannot be described without engravings.

CROFT, G., and S. D. STEEL. *Improvements in machinery or apparatus for combing and preparing wool and other fibrous substances.* Dated Dec. 24, 1857. (No. 3159.)

This consists in the employment of a number of combs, each forming a segment, and fixed to the outer ends of a set of radiating arms carried by a horizontal table which rotates upon a vertical shaft, the two being severally driven by bevel gearing from a horizontal shaft, which receives its motion from a main driving shaft carried in the framing of the "drawing-off" mechanism, or other convenient part. The combs, whilst rotating, continuously pass in front of a feeding apparatus, and whilst advancing thereto have a peculiar combing motion imparted to them by means of cranks, eccentrics, and tappets, which cause them to rise and fall, whilst they advance in a radiating direction from the centre. The combs, just before they arrive at the drawing-off rollers, approach again towards the centre of the table, and are freed from dirt by a circular brush, after they have passed the drawing-off mechanism. Self-acting clutches on the shafts which actuate the combs are thrown in and out of gear by levers, worked by a cam or guide, so as to stop their combing motion while the sliver is drawn off, and the combs are passing through heated boxes for heating the comb teeth.

HART, G. W. *Improvements in the construction of locks, and in apparatus for cutting keys.* Dated Dec. 24, 1857. (No. 3160.)

The improved lock has tumblers acted on by a key, as in an ordinary Chubb's lock, only the tumblers are so arranged that, when they are moved by the key to withdraw the bolt, they lift each a slide, which works in guides. Each slide is furnished with a projection which, when the slides are properly ranged, and the bolt is shot back by the key, enter into recesses in pieces attached to the plate of the lock; but, if the slides are not properly ranged, then the slides and the pieces attached to the plate come in contact, and prevent the bolt going back. To prevent the arrangement of the slides from being changed when the bolt has been pushed partially back, the patentee forms the slides with teeth like a comb, and, as soon as the bolt begins to move, a projection on the back plate enters between the comb teeth, and so prevents the slides from being moved vertically; if, then, the slides have not been ranged correctly at first, the error cannot be corrected after the bolt has begun to move. Modifications are included.

BURLEY, G. *Improvements in apparatus for cutting the pile of fustians and other pile fabrics.* Dated Dec. 24, 1857. (No. 3161.)

These relate to apparatus for cutting the pile where the fabric is conducted by mechanical means in connexion with the cutters employed, and especially to apparatus such as that for which letters patent were granted to J. Burley, 15th Nov., 1852, and consist in a number of modifications of the details.

WILSON, H. C. F., and T. GREEN. *Improved machinery or apparatus for making rivets.* Dated Dec. 24, 1857. (No. 3163.)

This machinery consists of a frame supporting a main driving shaft, on which are two riggers and a fly wheel. The shaft also carries three cams, one for working the cutting shears, another for working a heading tool, and the third for regulating the length of iron to be fed into, and cut off by, the shears. There is a spring to draw back the heading tool after the head is formed, and to allow of the finished rivet being forced out. There is a vibrating swing head fixed to the framing of the machine, and a wedge connected to a lever which receives an up and down motion from the first cam. These and the remaining details cannot be properly understood without engravings. An important feature in the machinery consists in the heading tool striking in a horizontal line with the axis of the rivet, the circular motion of the header in ordinary machines being found very objectionable in practice, in consequence of its having a tendency to drive the head of the rivet on one side.

BURLEIGH, B., and F. L. DANCHELL. *Certain improvements in the manufacture of vessels, plates, or utensils used for domestic, sanitary, electric, and manufacturing purposes.* Dated Dec. 24, 1857. (No. 3164.)

The object here is the formation of the above articles from plastic and other materials, to be rendered solid by percussive force, and afterwards submitted to the action of heat in closed vessels.

CHAPLIN, A. *Improvements in steam engines, and in the combustion of fuel.* Dated Dec. 26, 1857. (No. 3165.)

This relates to a previous patent of the patentee, dated 10th April, 1855. It consists mainly of two general arrangements of engines respectively fitted for use as "portable, agricultural, or roadway engines," and as contractors' engines for employment in constructive works. Under both these forms the main details of the engines, boilers, and furnaces are the same as those already described in the specification of the patent before referred to, but with certain modifications.

BRUCE, A. *Improvements in watches and timepieces.* Dated Dec. 28, 1857. (No. 3168.)

This relates, 1. To modes of working the independent seconds. Instead of employing two main springs and two trains of wheels to work the independent seconds and time, the patentee uses only one main spring and train, and places on the arbor of the escapement a ratchet wheel or chuck of any number of teeth, which acts by a lever spring and catch upon a ratchet wheel placed upon the staff or shaft of the pinion, the boss of the said wheel carrying the independent seconds hand. 2. To chronometer escapements, having circular pallets, in which he employs a lever and spring to lock and unlock the wheel, acted upon by a smaller roller, having two small stones placed so as to form a slit or fork, or one stone slit so as to form a kind of fork or opening.

BARLING, J. *An improved paddle for propulsion on water.* Dated Dec. 28, 1857. (No. 3169.)

The paddle is revolving, and is of the vertical class, but it differs from others of this class, 1. In being composed of not more than two arms or radii, with a float or blade at the end of each. 2. In its method of feathering. 3. In its power of adaptation to the changing buoyancy of a ship, by means of the lengthening or shortening of its arms. The invention cannot be described without engravings.

JOHNSON, J. H. *Improvements in the treatment and preservation of skins, furs, wool, and textile fabrics, and in the machinery or apparatus employed therein.* (A communication.) Dated Dec. 28, 1857. (No. 3170.)

The principal feature in this invention is the combination of heat and powerful tension, the skins being stretched in suitable frames, held by nippers closed upon them by sliding rings, and then placed in a chamber capable of being hermetically closed, and heated to a temperature of from 100° to 160° Fahr. The skins may be fumigated whilst in the hot chamber by throwing on to a brisk fire a mixture of chloride of lime and sulphur, or powdered wood charcoal, iron filings, powdered resin, flower of sulphur, chloride of lime, and leaves and wood of the walnut-tree. After 6 or 8 hours the skins are removed to an airy situation for 48 hours, and the process is complete. In treating furs, the process may be repeated several times, and odoriferous substances added to the fumigating compound. In treating fleeces of wool they are placed on a

grating, and kept agitated by a set of rotating spikes, to subject them thoroughly to the heat and fumes.

BOYDELL, J. *Improvements in carriages propelled by steam or other power.* Dated Dec. 28, 1857. (No. 3172.)

The patentee employs apparatus by which power is taken from the wheel and applied as a forward push to the carriage. He places a pin on the wheels at some point between their centres and their peripheries, or cranks upon the axle if it rotates, and from the pins connecting rods pass to the rods and pistons working in steam cylinders fixed to the frame of the engine, and steam is constantly admitted from the boiler to these cylinders. To allow of the engine being reversed, means are applied for cutting off the steam from these cylinders; or this end may be attained by other means.

DESMOUTIS, H. *New metallic alloys.* Dated Dec. 28, 1857. (No. 3174.)

This consists in mixing pulverulent rhodium, iridium, or ruthenium with platinum in the same state, and forming ingots in the manner adopted with platinum. These mixtures are to be used for philosophical and surgical apparatus, &c.

GRIFFITHS, J. T. *Improvements in the manufacture and ornamenting of lace.* Dated Dec. 28, 1857. (No. 3176.)

This consists, 1. In a mode of laying "gimp" threads and "thick" threads, by working in the said threads between the warp threads at the same time as the fancy and net work of the lace are being made. 2. In ornamenting lace by causing figures, &c., of any desired colour, previously prepared by being cut or stamped out of velvet, cloth, terry-velvet, &c., to adhere to both sides of the lace, and back to back, so that the figures cannot be detached from the lace without tearing it.

HOLDEN, I. *Improvements in preparing and combing wool and other fibres.* Dated Dec. 28, 1857. (No. 3177.)

These improvements relate, 1. To preparing fibres for combing, in order to straighten the same, by passing them through sets of gill comb apparatus in succession, in such manner as to obtain a considerable draught, by employing in the second gill apparatus gill bars of a considerably increased breadth upon the fibres between the two sets of gill apparatus. 2. To increasing the breadth of the gill bars to about the length of the staple under operation, or, when the fibres are very long, proportionate to that length, and with such gill apparatus the patentee makes the teeth tapered and much thicker and longer than usual. 3. To applying to such broad combs perforated plates, bars, or other grating capable of raising up the teeth of the comb, and thereby raising the fibre up the teeth at the time the combs descend, to facilitate the drawing off. 4. To forming broad combs for preparing raw fibre with the successive rows of teeth of increasing fineness. 5. To such combs when used in working combs. 6. To making working gill combs longer than hitherto. 7. To the application of two square motion or other gill machines as working combs to one circle. 8. To gill machines actuated by square motion in place of screws, to the application of springs in place of counter weights to check momentum. 9. To facilitating the removal of the noil and refuse as taken from the combs, by passing the doffer comb or plate in between another double doffing means. 10. To employing two or more pairs of drawing off rollers, one arranged to draw off the longer fibres at a suitable draught, and the next the shorter at a less draught. 11. To giving an inclination to the points of the staple, in the direction of the working combs (to facilitate their being more uniformly taken by them), by endless belts. 12. To a combination of parts forming a filling head especially adapted to fill on unprepared, imperfectly prepared, or any loose fibre. 13. To clearing the brush used to direct the points or beard of the fibre projecting from the carrying comb, by a comb or doffer. 14. To the application of a plate to support the ends of the fibre in their passage to the brush, such plate having an up and down motion given to it, corresponding with the motion of the gills. 15. To the application of a plate to which a quick motion is given, with a tendency to force the fibre into the teeth of the carrying or travelling comb, between the point of feed thereto and that of operation by the gill or other working combs.

SPENCER, T. *Improvements in the purification of illuminating or lighting gas.* Dated Dec. 29, 1857. (No. 3178.)

This consists in the use of spathose iron ore, or magnetic oxide of iron, for the purification of gas.

PARKES, A. *Improvements in joining or uniting metals.* Dated Dec. 29, 1857. (No. 3181.)

This invention consists in using zinc, or zinc and mercury, in place of ordinary solders. Zinc may be used in strips with a flux placed between the edges or surfaces of the metal to be joined; or it may be used in a granular state with a flux. The surfaces are heated by gas or otherwise until the zinc, or amalgam, melts. They are then subjected for a short time to higher heat, by which the joining or uniting will be accomplished.

MOUROT, V. *Improvements in furnaces for heating kilns and ovens used in the manufacture of pottery and earthenware, parts of which improvements are also applicable to furnaces generally.* Dated Dec. 29, 1857. (No. 3182.)

This consists in constructing such furnaces so that they can be fed with fuel out of a truck from the bottom upwards.

GOMES, E., and W. MILLS. *An improved composition for trains or safety fusees, and similar purposes.* Dated Dec. 29, 1857. (No. 3183.)

The composition consists of equal parts of chlorate of potash in fine powder, and ferro-cyanide of lead, tin, or zinc, &c. These are mixed with alcohol to the consistence of paint, and applied to a strip of paper, which is to be encased in a winding of fibrous material, tape, or similar substance, that will keep the powder in its place when dry. The winding should be coated with shellac or other varnish, to resist moisture. The fusee thus formed will explode when slightly damp, and will not be injured in its explosive qualities by being wetted, if it be dried before using; but it may be enclosed in a strip of paper or winding of fibrous material and rendered waterproof by immersion in tar, pitch, or gutta percha.

BLAKE, J., and R. D. KAY. *An improved apparatus for reducing and regulating the quantity, force, or pressure of steam.* Dated Dec. 30, 1857. (No. 3184.)

This consists of certain apparatus by which the pressure of steam may be reduced to, and regularly maintained at, any desired point below that within the boiler, so that steam of two or more different pressures may be procured from one boiler. The patentees claim the employment of an apparatus having hollow discs or shells connected to short tubes, altogether forming an expanding and contracting pipe, having its motion governed by a column of mercury and the generated pressure of steam, the said motion acting upon an equilibrium valve, and regulating the wire-drawn pressure of the steam which passes through the apparatus as described.

WARD, F. O. *Improvements in liberating or producing potash or soda, or both (as the case may be), from natural alcaliferous silicates, the residuum of the process being available as a material for manure, puzzolano, or hydraulic cement.* (Partly a communication.) Dated Dec. 30, 1857. (No. 3185.)

This has for its principal object the liberation of potash from felspar and from the more alcaliferous felspathic rocks. It is also applicable for liberating soda from soda felspar, &c. The powdered silicate is mixed with fluoride of calcium, and some earthy material, such as chalk. The whole is heated in a reverberatory furnace, and stirred meanwhile. The fritted mass thus obtained yields caustic potash or soda, or both, in greater or less abundance (according to the nature of the silicate heated), when heated with water to dissolve out its soluble con-

tents. The frit as it comes from the furnace may be used as manure, and the residue left after washing the frit still contains considerable fertilizing properties. This residue when lightly calcined may also be employed in the manufacture of hydraulic cement.

PALLING, F. *The construction of candles, lamps, and candle-lamps, without wicks.* Dated Dec. 30, 1857. (No. 3187.)

The oil passes in a small stream from the reservoir along a tube, and is deposited at the orifice or on the burner, so that upon these being slightly heated the oil is decomposed, and a vapour is formed, which, igniting, produces not only flame, but also the necessary heat to continue the distillation of the oil as it drops on the burner, the flow of the oil being regulated by a stop cock.

BOOTH, T. *Improvements in the treatment of certain vegetable matters, and in the application of the same to sizing, stiffening, dressing, and finishing textile materials, and which is also applicable to thickening colours for printing.* Dated Dec. 30, 1857. (No. 3188.)

This consists, first, in treating amylaceous materials in the dry state with oxalic acid, or other acids having a similar effect; secondly, in the application of vegetable materials so treated for the purposes above named.

MORRISON, J. D. *Improvements in effecting surgical and medical operations by the agency of artificially induced anæsthesia.* Dated Dec. 30, 1857. (No. 3189.)

In carrying out this invention in dental practice, the operator produces a cold action upon the tooth of the patient by applying thereto a bag or cushion in communication with the source of the cold liquid. The parts immediately surrounding the tooth are subjected to a current of cold air. Still further to secure the proper anæsthetical condition, an electric current may be applied by a wire to the parts under treatment. In all three applications, constant and graduated currents are used.

O'NEILL, J. *Improvements in apparatus for communicating betwixt the guard or passengers and the engine driver on railway trains.* Dated Dec. 30, 1857. (No. 3190.)

This invention was described at page 466 of vol. 68.

NEWTON, A. V. *Improved machinery for cutting corks and bungs.* (A communication.) Dated Dec. 30, 1857. (No. 3191.)

This relates to a method of applying and operating expanding cutters for cutting corks or bungs of conical form, and also to certain means of feeding the material to be operated upon to the cutters, which cannot be described without engravings.

CLINTON, J. *Improvements in the manufacture of wind musical instruments played by the mouth, and in mandrils used in such manufacture.* Dated Dec. 30, 1857. (No. 3192.)

The patentee claims, 1. The using of mandrils of an undulating form for the drawing of tubes for musical instruments. 2. Mechanism which enables the performer to close or keep closed the B natural hole and open the B flat hole, when B flat is taken with the fork fingering. 3. Two holes for the A natural key, instead of one, as formerly. 4. The arrangement of the G sharp key, so that it may be acted upon either by the first or second finger. 5. A new description of keys. 6. A new form of ligature. 7. A mouth piece and socket made in one piece instead of separately, as heretofore; and, lastly, a light elastic material for the bells of musical instruments.

HARMER, R. *Improvements in cigarettes.* Dated Dec. 30, 1857. (No. 3193.)

This consists in the application of glass, porcelain, or pipe-clay mouthpieces to cigarettes.

BUHRING, C. *Improvements in the combination of carbonized and carbonizable with other materials, and the manufacture of such compounds into various useful articles.* Dated Dec. 31, 1857. (No. 3194.)

This consists in mixing powdered ash, peat, coal, or wood, bone, dried blood, peat, &c., with from one-third to one-tenth of pitch, asphalte, sugar, wax, or any other bitumen, resin, or gum, &c.

HANSON, H. *Improvements in the manufacture and finish of cotton-band, twine, rope, cordage, and other fibrous substances, and in machinery or apparatus employed therein.* Dated Dec. 31, 1857. (No. 3195.)

These consist in the application of machinery to sizing and finishing, instead of hand labour, as heretofore adopted. The patentee employs a rail or tramway, and places upon it a travelling carriage, supported by wheels, and drawn either by hand or by drums and ropes. The top of the carriage forms the table for supporting the material to be sized and finished, and also holds the size, &c. The cotton-bands, twines, cords, or ropes are guided by reeds or combs on and off a frame or box, having a to and fro motion similar to that given by the hand finish, the said box containing rubbers of horse-hair.

WILSON, G. *Improvements in the furnaces or fire-places of steam boilers.* Dated Dec. 31, 1857. (No. 3198.)

1. Fire-places may be dispensed with, and in lieu thereof a hollow, perforated, wedge-shaped chamber is placed in the fire box, and forms a support for the burning fuel, to which air obtains access through the perforations. From the top of the chamber rises a pipe, which establishes a communication between the water space of the raised chamber and the water space of the boiler. The feed water is heated before it is pumped into the boiler. 2. A novel form of damper is used.

LONG, J. *Improvements in the construction of sewers, and in the means of discharging the contents thereof.* Dated Dec. 31, 1857. (No. 3200.)

This consists of arrangements which will permit the solid matter to be easily deposited along the general course of the sewer, and generally as soon after leaving its source as possible, while the purely liquid portion is carried easily away, and either distributed over land as a manure, or conveyed into reservoirs and deodorized, or into rivers. The patentee proposes also to provide means of easy access to any part of the sewers, so as to allow certain mechanical combinations to withdraw and collect the solid matter deposited in the sewers.

BRUN, L. J. A. *Improvements in instruments for measuring angles, applicable to nautical and other purposes.* Dated Jan. 1, 1858. (No. 3.)

This relates to a compensating protractor, which allows of at once placing on paper the angles or directions measured in nature with a magnetic needle or compass in reference to the magnetic meridian, and that without taking into account the variation or the declination of the magnetic needle at each operation. Engravings are required to illustrate this invention.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

SARAIVA, A. R. *An improved candlestick or holder.* Dated Dec. 26, 1857. (No. 3166.)

The inventor employs a tube of rather larger dimensions than the candles, closed at bottom, where a space is left for a float or cork, to permit of its playing up and down the tube. A water-tight chamber is fixed at its top and bottom parts to the upper circumference of the tube. Water is made to fill the tube to a certain height. The candle being then inserted causes the water first to rise and fill the empty space in the tube, then to enter the chamber through a hole in the part of the tube covered thereby. This tube also serves for the gradual return of the water in the chamber into the lower part of the tube, where the float plays whilst the candle goes on consuming and rising. A little above this hole another hole is made to fix the level of the water in the inner tube, causing

the candle to burn at the desired height above that level.

PARSONS, C. F. *Cleansing and re-burning animal charcoal.* Dated Dec. 26, 1857. (No. 3167.)

This consists of a vertical revolving metal plate, on which the charcoal is placed. This plate revolves in an air-tight furnace with a double fire acting under it. At the end of each fire there is a bridge at right angles with the bars of the furnace, for retaining the heat. The flame travels twice round the revolving plate. The plate travels on an upright shaft, which is protected from the fire by a hollow tube. The revolving plate is fed with charcoal from the top by a hopper, which spreads it over the plate in any thickness. There are also in the furnace two elevators, that stand at right angles. These assist the hopper in spreading the charcoal. There is also a scraper which stands at an angle of 45°, and when the charcoal is sufficiently burnt the scraper is lowered by a double-acting screw and bevel gearing, and scrapes the charcoal off the plate into an internal tube with an oblique bottom, which discharges it outside the furnace.

DEACON, H. *Improvements in purifying alkaline lees.* Dated Dec. 28, 1857. (No. 3171.)

This consists in the application of salts of magnetic oxide of iron, or of sesquioxide of iron, or of the corresponding oxides.

THOMPSON, H. *Improvements in the application or use of a certain substance as a substitute for glue, paste, cement, varnish, and other similar compounds.* Dated Dec. 29, 1857. (No. 3179.)

The inventor proposes to use silicates of soda or of potash.

HARGREAVES, J. and J. *Improvements in winding up watches which have not fusees or chains.* Dated Dec. 29, 1857. (No. 3180.)

This consists in using an extra ratchet wheel, and gearing it with the ratchet wheel at present used; by this means the inventor can wind up the same way as English watches which have fusees and chains, and thereby prevent the possibility of these watches being put out of repair by winding the wrong way.

TOOTH, W. H. *Improvements in furnaces.* Dated Dec. 30, 1857. (No. 3186.)

The inventor makes a furnace with its ash pit, smoke box, flues, and chambers, air-tight, or nearly so, and furnishes it with a door for the introduction of the fuel from time to time, which, when closed, is made air-tight. He introduces the air required from a blast apparatus, so that it may pass in contact with the burning fuel, and regulates the quantity and force of air according to the heat desired. That end of the furnace which usually opens into the chimney is closed air-tight, and furnished with a safety valve which, when open, will allow the gases to escape into the chimney.

BARLOW, P. W. *Improvements in the permanent way of railways.* Dated Dec. 31, 1857. (No. 3196.)

This consists of a mode of constructing chairs where the rail is seated altogether in wood, and of a mode of securing the rails in such chairs. The novelty consists in making the sides or cheeks of chairs cast in one piece parallel or slightly inclined to the top of the rail, and in the use of one wedge or key on each side of the rail.

RAMAR, A. J. M. *Improvements in ornamental and portable fountains.* Dated Dec. 31, 1857. (No. 3197.)

The vessel containing the apparatus and the water is by preference formed into a pedestal below the basis of the fountain. A double-acting force pump is fixed within the vessel. At one end of the pump barrel is fixed an air pipe, the upper end of which enters into an inner vessel, so that its upper outlet comes just below the top of the inner vessel. This vessel is above the level of the water in the water vessel, and it has a descending tube, the lower end of which comes to near the bottom of the outer vessel, where there is a valve through which the water and air can pass. At the other end of the pump is another air pipe, which rises to a position above the water level in the outer vessel. The action of the fountain cannot be clearly explained without engravings.

MIDDLESHIP, W. *Improved machinery or apparatus for obtaining motive power.* Dated Dec. 31, 1857. (No. 3199.)

This consists principally of a wheel mounted on a spindle. The rotation of this wheel is to be kept up by maintaining a weight of water always on one side of the wheel, or, if the wheel be immersed in water, by the inflation of chambers with air on one side only of the wheel.

HENRY, J. *Improvements in weaving fabrics for ladies' dresses and petticoats.* Dated Jan. 1, 1858. (No. 1.)

This consists in weaving fabrics with casings, into which strips of steel, &c., are inserted.

PARKES, A. and H. *Improvements in the manufacture of rods, wire, nails, and tubes.* Dated Jan. 1, 1858. (No. 5.)

Here copper, or copper and its alloys with zinc, are combined with such a quantity of phosphorus, or with the metal manganese, as will admit of the compound being rolled and worked hot or cold into rods, wire, nails, and tubes, using about 8 oz., more or less, of phosphorus or metal manganese in each 100lbs. of the compound.

SCOTT, T. *Improvements in cleaning, separating, and mixing seeds, and in apparatus for those purposes.* Dated Jan. 4, 1858. (No. 10.)

The inventor cleans grass or other seeds from the seeds of weeds which have tails or horns, by causing the seeds to drop upon an inclined grating sieve with longitudinal holes or bars. The grass seed slides down the grating to one side, while the seeds of the weeds acquire a spiral motion, or such a position in falling as to cause them to pass through the grating. There are various modifications included.

TILLAM, E. T. *Improvements in apparatus for ventilating buildings.* Dated Jan. 4, 1858. (No. 11.)

Where a gas burner or gas stove is employed to carry off noxious vapours, an outlet pipe is used at or near the upper part of the room, &c. Into the outlet pipe the heated product of each gas burner is conducted by an inverted conical passage placed over the burner, and connected above to the outlet pipe. To insure a free current from the room, &c., outwards through the outlet pipe, steam is conducted into that passage near to its outer end, and such steam is generated by the heat of one or more of the gas burners, or by the heat of a gas stove, there being a vessel containing water applied to such gas burner or gas stove, so as to generate steam sufficiently under pressure to cause it to pass in a jet or jets when it comes to the outlet pipe.

KIDDLE, E. H. *Improvements in smut machines.* Dated Jan. 4, 1858. (No. 13.)

This consists of an upright cylindrical chamber, having a central shaft receiving a rapid rotary motion, and on which are fixed some of the parts which act on the grain, and separate the smut therefrom, in combination with fixed and stationary parts. The grain is admitted through a spout, and enters a chamber in which a fan forces a current of air up the ingress spout, and subjects the corn to a preliminary blast, which separates any light stuff from it. It is then received in a conical hopper, which conducts it into and through the eye of a stationary stone, the under surface of which is cut somewhat like a mill stone. A roughened disc is supported on the shaft immediately below the stone, which has a small raised lip around the circumference to prevent grain flying off too quickly. The rotary motion carries the grain towards the circumference, and between it and the stone, which subject it to an active rubbing action. It then falls down between a roughened conical surface and the periphery of the machine. The roughened conical surface rubs the grain against the circumference, which is of wire cloth, and which not only removes the smut and dirt, but

in a great measure separates it by forcing it through the meshes of the wire cloth while the grain falls into a second hopper, which conducts it through the eye or centre of a disc, brush, or base, fixed on the shaft, falling through which it is well brushed on a roughened metal plate with which the brush is in contact. The grain is carried towards the circumference of the brush by the rotary motion, and falls into a delivery spout, in which it is again subjected to the action of a blast.

TWIGG, J. N. W., and W. ADKINS. *Certain improvements in self-acting railway brakes.* Dated Jan. 5, 1858. (No. 15.)

This consists in connecting the buffer rods of railway carriages to spring or other levers, secured by pins to the frame of such carriages, which pins form the fulcrums on which they work. To the lower end of these levers the brakes are attached. By this arrangement the brakes are removed from the periphery of the wheels when draught way is on the carriage, but the moment the power by which the traction is effected stops or slackens its speed, the carriages are pressed together, and, as the buffers come in contact, so the brakes act on the periphery of the wheel with more or less force, and arrest their further progress. For reversing the direction of the carriages to which such brakes are applied, the buffers are held by connecting rods and simple or compound levers, which may be simultaneously brought to act on all of them at once, so that they cannot be compressed, and by their connection with the brakes impede the free action of the wheels.

PROVISIONAL PROTECTIONS.

Dated May 1, 1858.

974. J. Phymoni, of Crooked-lane, City, mechanist. Improvements in apparatus for catching fish in tidal rivers and other water courses.

Dated June 29, 1858.

1462. E. Stevens, of Cambridge-road. An improved cooking utensil.

Dated July 8, 1858.

1530. J. F. Stanford, of Howard-st., Saint Clements, engineer. A new and improved method of and apparatus for applying heated air in drying corn, hay, and other like articles, in the stack or otherwise, and in drying goods, and in heating and drying rooms and buildings.

Dated July 9, 1858.

1546. G. Parsons, mechanical engineer, of High-street, Lambeth. Improvements in apparatus for the prevention of injury to, and the sudden bursting of steam boilers.

1548. F. Sang, of Charing-cross, artist, and T. W. Rammell, of Spring-gardens, civil engineer. Improvements in the means of conveying letters and parcels from one place to another.

1550. F. H. Edwards, of Gateshead, civil engineer. Improvements in pneumatic springs for railway carriages and other purposes.

1552. W. E. Newton, of Chancery-lane. Improvements in the construction of umbrellas and parasols. A communication.

Dated July 10, 1858.

1554. G. H. Wain, of Liverpool, block maker. Improvements in reefing and furling sails.

1556. J. F. Watson, of Bayswater, and V. B. Fadeuilhe, of Newington-crescent. Improvements in the preparation of cocoa and chocolate, and also of nutritive compounds from the seeds of the plant called Soja Hispida and Cicer Arietinum.

Dated July 12, 1858.

1560. J. Macintosh, of Aberdeen, engineer. Improvements in apparatus for the manufacture of articles of confectionery.

1564. D. S. Wilton, of Tibberton-square, Islington. Improvements in pianofortes.

1566. J. Taylor, of Roupell-park. Improvements in the manufacture of blocks for the construction of sewers, drains, and arches.

Dated July 13, 1858.

1568. E. Chard, of Islington, pianoforte manufacturer. Improvements in pianofortes.

1570. J. A. Fussell, of Birmingham, manufacturer. A new or improved method of ornamenting chandeliers, pendants, and brackets, for gas and other lamps, which method of ornamenting is also applicable to curtain bands.

1572. J. Edwards, of Aldermanbury, and T. Newey, of Birmingham. Improvements in the manufacture of blind furniture.

1574. G. Buchanan, of Bucklersbury. Improvements in sugar-cane mills.

1576. W. Beadon, of Otterhead, Honiton. Improvements in the manufacture of bags for corn and other articles, and sails for ships.

Dated July 14, 1858.

1580. W. Woodcock, of Great George-st., Westminster, engineer. Certain improvements in apparatus for warming air.

1582. J. Cowan, of Liverpool, cabinet-maker. An improved screw-nail.

1584. J. Jones, of Oxford, engineer. Improvements in meters for measuring liquids.

1586. T. Wheeler, of Oxford, engineer. An improved combination of machinery for cutting, slicing, grating, and pulping turnips, mangold wurzel, and other roots.

1588. T. Wheeler, of Oxford, engineer. Improvements in washing, wringing, and mangling machines.

Dated July 15, 1858.

1592. C. W. Williams, of Liverpool, gentleman. Improvements in locomotive and other boilers for giving them increased power in generating steam.

1596. W. A. Gilbee, of South-st., Finsbury. Improvements in the mode of covering cotton, woollen, and other thread with silk, and in the apparatus connected therewith. A communication.

1598. A. H. J. Bastable, of Pimlico. Improvements in apparatus employed in the production of light. A communication.

1600. P. Fairbairn, of Leeds, machinist. An improvement in lathes. A communication.

1602. W. Betts, of Wharf-road, City-road, capsule manufacturer. Improvements in the manufacture of capsules and in the apparatus to be employed therein.

Dated July 16, 1858.

1604. F. Priestley, of Berners-st., pianoforte maker. Improvements in condensing steam engines.

1606. M. Voss, of Billiter-sq. Safely submerging ocean telegraph cables and other heavy bodies in rivers, lakes, and seas, by means of inflated buoys and connecting gear.

1608. A. P. Price, of Margate, chemist. Improvements in the treatment and smelting of certain ores or compounds of tin, and of tin, and of certain alloys thereof.

1610. T. F. Chorley, of Cottage-place, City-road, solicitor. Improving the form of bankers' cheques and other similar documents, with the view of preventing fraudulent dealings therewith.

Dated July 17, 1858.

1612. T. Hart, of Glasgow, plumber. Improvements in taps or valves, and in apparatus for regulating the flow of fluids.

1614. J. T. Smith, of Dudley, Worcester, iron master. A new or improved manufacture of coke.

1616. R. A. Brooman, of 166, Fleet-st., editor of the *Mechanics' Magazine* and patent agent. Improvements in apparatuses for the reception of fecal and sewage matters, and in the treatment of fecal matters. A communication.

1618. W. A. Lloyd, of Portland-road, tank

manufacturer, and E. Edwards, of Anglesea, gentleman. Improvements in aquaria tanks and similar receptacles for aquatic animals and plants.

Dated July 19, 1858.

1619. J. J. Desmares, manufacturer, of Vire, France. A new process for oiling wools.

1621. C. Bray, of Bayswater. Improvements in ice safes.

1622. H. Smith, of Dudley, Worcester, manufacturer. An improvement or improvements in the manufacture of harrows.

1623. C. Reeves, of Birmingham, manufacturer. Improvements in repeating fire-arms.

1624. T. Greenwood and J. Batley, of Leeds, machine makers, and J. Salt, of the same place, silk spinner. Improved machinery for preparing silk to be spun.

1625. J. W. Wilson, of Duke-st., Adelphi, civil engineer. An improved preparation of materials to be used for roofs and other parts of buildings, and for various purposes for which wood is now generally employed.

1626. W. Tasker, jun., of Waterloo ironworks, near Andover, engineer. Improvements in combined thrashing machines.

1627. T. F. Chorley, of Cottage-place, City-road, solicitor. Improvements in the form of bankers' cheques and other similar documents, with the view of preventing fraudulent dealings therewith.

1628. W. Herapath, of Bristol, analytical chemist. An improvement in the manufacture and treatment of paper with the view to the prevention of forgery.

1629. C. Lambert, of Sunk Island, York, farmer. Improvements in collars for horses and other draught animals.

1630. S. Maw, of Aldersgate-st., surgical instrument maker. An improved feeder for administering food.

Dated July 20, 1858.

1631. J. Schmitt, of Guernsbach, Baden, engineer. Cementing, hardening, and tempering rails for railways and also axles for railway carriage wheels.

1632. J. Chadwick, of Castleton Print Works, near Rochdale, manager. Improvements in the application of certain woven fabrics to printing purposes.

1633. J. Shand, of Blackfriars-road, fire engine manufacturer. Improvements in fire engines and pumps.

1634. T. Bailey, of New Orleans, gun manufacturer. Improvements in repeating fire-arms.

1635. J. C. Hill, of Kentish Town. Improvements in making joints for connecting pipes and other articles by means of lead or other soft metal.

1637. C. Doley, of Birmingham, manufacturer, E. Bigland, of Smethwick, designer, and T. H. Worrall, of Smethwick, lithographer. Improvements in ornamenting metallic and non-metallic surfaces.

1638. G. Wheatley, of Bethnal-green-road, stick maker. An improvement in the ornamenting of sticks.

1639. R. A. Brooman, of 166, Fleet-st., patent agent. Improvements in movable apparatuses for receiving fecal and sewage matters. A communication from G. M. Legé.

1640. W. N. Nicholson, of Newark-on-Trent, agricultural implement maker. Improvements in crushing mills.

Dated July 21, 1858.

1643. E. Hardon, of Stockport, manufacturer. An improved manufacture of woven fabric for covering umbrellas and parasols.

1644. J. W. Wilson, of Barnsley, timber merchant. Certain improvements in machinery or apparatus for turning and cutting wood and other substances.

1645. M. Matley, of Ashton-under-Lyne, engineer. Improvements applicable to steam boilers for consuming smoke and economising fuel in the generation of steam.

1646. T. Piatti, of Paris, gentleman. An improved propeller.

1647. L. Cunq, of Bordeaux. Improvements in calculating machines.

1648. H. Allnutt, of Fleet-street, civil engineer. A vehicle for lamplighters.

1649. J. W. Giles, of St. Martin's-le-Grand. Improvements in locomotive or traction engines.

1650. J. Meacock, of Snow-hill, gas meter maker. Improvements in wet gas meters.

Dated July 22, 1858.

1651. D. W. Warder, of Caroline-place, Chelsea, draughtsman. Improvements in the manufacture of beams, girders, ships' ribs or frames, and other structures of wrought iron.

1652. B. Blake, of Eccleston, near Preston, earthenware manufacturer. An improved kiln for burning earthenware and other similar articles.

1653. H. Green, of Liverpool, ironmonger. A new or improved hinge for hanging and closing doors, grates, or windows.

1654. C. Gammon, of Cloak-lane, solicitor. Improvements in the fastening of envelopes and letters.

1655. W. L. Thomas, of Union-st., Berkley-sq., esq. Improvements in ordnance, fire-arms, and apparatus generally in which gunpowder is employed.

1656. J. B. P. A. Thierry, jun., of Paris. Improvements in furnaces.

1657. A. B. Tripler, of Brompton. Improvements in obtaining products from a species of asphaltum at present found in the Island of Cuba, and called chapafote.

1658. H. Higgins, of Salford, machinist, and T. S. Whitworth, of the same place, manager. Improvements in machinery for spinning and doubling or twining cotton and other fibrous materials.

Dated July 23, 1858.

1659. L. J. Marks, of Newport, Monmouth, nautical instrument maker. Improvements in compasses.

1660. W. A. Gilbee, of South-st., Finsbury. An improved rotary engine. A communication.

1661. R. P. Walker, of New York. Improvements in machinery for hulling and finishing rice and similar grains.

1662. H. Barber, of Leicester, manufacturer. Improved machinery for producing knitted fabrics.

1663. G. Brokelbank, of Lombard-st. Improvements in laying submarine cables for telegraphic purposes.

1664. W. Parsons, of Pratt-st., Lambeth, manufacturing engineer. Improvements in separating the solid matter from sewage waters.

1665. H. J. Giffard, mechanician, of Paris. Improvements in feed apparatus for steam and other boilers, which improvements are also applicable to the raising and forcing of fluids.

Dated July 24, 1858.

1666. C. Atkinson, of Sheffield, manufacturer. A certain improvement in Venetian blinds.

1670. S. Townend, of York. Improvements in cranes.

1671. J. F. Belleville, of Paris, civil engineer. An improved smoke-consuming apparatus or furnace.

1672. H. C. Traphagen, of New York. Improvements in ladies' skirts.

Dated July 26, 1858.

1674. D. Adamson, of Hyde, Chester, engineer. Improvements in hydraulic apparatus for raising and lowering heavy articles, and in the application

of hydraulic power for rivetting metallic structures, as iron ships' boilers, tanks, and similar articles.

1675. C. F. Vasserot, of Essex-st., Strand. Improvements in glass roofs, skylights, and other glass structures. A communication from P. F. R. Gonsault.

1676. A. Sax, of Paris, musical instrument maker. Improvements in wind musical instruments.

1677. J. Cooke, of Belfast, gas singer. Improvements in singeing, treating, or finishing textile fabrics.

1678. J. Hardie, of Stirling, plumber. Improvements in apparatus for regulating the flow or passage of fluids.

1679. J. Taylor and J. Nimmo, of Glasgow. Improvements in healds, and in machinery or apparatus for making healds.

1680. B. T. Harris, of Brooklyn, U.S. Improvements in registers for indicating the presence or absence, and the time of arrival and departure, of workmen or employés.

1681. C. De Jongh, of Lautenbach, France, manufacturer. An improved system of, and machinery for heckling or combing flax, silk, or other fibrous substances.

1682. T. Hall, of Mildmay-park, Islington, bachelor of arts. Improved apparatus for indicating a rise of temperature in confined spaces.

1683. E. Jones, gentleman, of Camden-town. Effecting a better system of drainage, and the machinery and apparatus necessary for the same, whereby the sewage manure is collected and conveniently exported for use, and the noxious effluvia prevented from contaminating the air of populous cities and towns, and whereby the drains may be more strongly and securely built, by the manufacture of a more suitable and better material.

1684. H. Jackson, of Woolwich. Improvements in preparing lubricating matters.

1685. J. Hope, of Rhode Island, U.S. A new and useful mechanism or apparatus for supporting and adjusting a graver of a machine, for engraving the surface of a calico printer's roller, preparatory to the same being etched.

1686. J. Davies, sergeant-major, Royal Military College, Sandhurst. Improvements in cloaks for military and other purposes.

1687. P. A. Godefroy, of New North-road, operative chemist. Improvements in the cleansing of gutta percha, and in the more perfect insulation of electric telegraph wire.

1688. H. Glover, of New York, mathematical instrument maker. Improvements in instruments for measuring angles and taking altitudes.

Dated July 27, 1858.

1689. H. Ashton, of Kirkdale, Lancaster, engine driver. Improvements in the furnaces of steam boilers.

1691. J. Emes, of Great Russell-st. A portable folding bedstead.

1695. J. Long, of Little Tower-st., philosophical instrument maker. Improvements in cooling brewers' and distillers' worts and other liquids.

PATENT APPLIED FOR WITH COMPLETE SPECIFICATION.

1696. G. Hurn, of Norwich. Improving the manufacture of certain articles made from fibrous materials. Dated 28th July, 1858.

NOTICES OF INTENTION TO PROCEED.

(From the "London Gazette," August 10th, 1858.)

634. J. Young. "Signalling on railways."
635. W. Robjohn. "Organs."
638. W. Moxon, J. Clayton, and S. Fearnley. "Paying out telegraph cables."
642. R. M. Butt. "Night-lights."
643. H. Doulton. "Sewers and drains."
653. J. Welch. "Portable railways."
656. F. Bousfield. "Production of duplicate writings."
664. J. C. Durand. "Chain cables."
671. J. C. Durand. "Iron."
673. T. Silver. "Pulsating valves or governors."
686. J. Mercer. "Leather."
691. R. Barr. "Making rivets, spikes," &c.
700. T. Boardman. "Looms."
701. C. G. Russell. "Printing."
713. H. Cartwright. "Excentrics."
714. E. Edwards. "Glass finger-plates for doors."
715. S. Minton and R. H. Thomas. "Battery."
722. J. Smith. "Pile fabrics."
735. D. Davy, W. Bentley, and J. Davy. "Looms."
755. G. Davies. "Wads for ordnance." A communication.
792. H. Whittles, J. Schofield, E. Leach, and J. Lord. "Steam engines."
806. J. Gorham. "Optical instruments."
847. W. Latham. "Hats and caps."
873. M. Ross. "Frames for pictures," &c.
905. J. Maitre. "Washing iron mineral."
938. D. E. Hughes. "Transmitting signals."
1126. J. Copcutt. "Obtaining light."
1284. R. Hicks. "Compositions to be employed as black lead."
1313. T. W. Mellor and W. Jamieson. "Looms."
1509. J. Hodgkinson. "Kneading dough."
1526. G. A. B. Chick. "Black lead."
1552. W. E. Newton. "Umbrellas and parasols." A communication.
1563. R. A. Brooman. "Wire heddles." A communication.
1592. C. W. Williams. "Boilers."
1593. R. Brazier. "Fire-arms."
1600. P. Fairbairn. "Lathes." A communication.
1605. C. de Bergue. "Telegraph cables; paying out such cables."
1608. A. P. Price. "Smelting tin."
1609. C. S. Putnam. "Hardening vegetable gums, oils," &c.
1612. T. Hart. "Taps or valves."
1616. R. A. Brooman. "Treatment of fecal matters." A communication.
1677. J. Cooke. "Textile fabrics."

The full Titles of the Patents in the above List can be ascertained by referring back to their numbers in the Lists of Provisional Protections previously published.

Opposition can be entered to the granting of a Patent to any of the parties in the above List who have given notice of their intention to proceed, within twenty-one days from the date of the Gazette in which the notice appears, by leaving at the Commissioners' office particulars in writing of the objection to the application.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

1683. R. P. Huthnance.
1763. H. J. Betjemann.
1774. J. Macintosh.
1784. C. Bedells.
1785. S. C. Lister.
1786. J. A. Manning.
1787. J. H. Johnson.
1796. R. B. Cooley.
1879. A. R. Le M. de Normandy.

LIST OF SEALED PATENTS.

Sealed August 9th, 1858.

254. A. Chambers and W. H. Champion.
256. R. Bell.
257. G. A. Barrett, W. Exall, and C. J. Andrewes.
259. C. & G. Johnson.
268. J. Clifton.
274. J. Macintosh.
276. J. E. Ryffel.
277. J. C. H. Sievier.
285. J. Tall.
291. J. Garnett.
295. T. B. Daft.
302. P. Heyns.
307. E. Cuvelier.
325. W. Clark.
436. C. Eyland.
448. G. Davies.
460. P. A. Cap.
489. J. Young.
586. A. V. Newton.
692. A. Pelez.
704. A. Pelez.
705. V. Gâche.
707. A. Pelez.
796. R. A. Brooman.
1102. S. Higgs, jun.
1107. A. A. Croll.
1115. J. Bottomley and A. H. Martin.
1144. J. Foot.
1208. J. Shuttleworth.
1212. S. Rockett and J. J. Reynolds.
1238. D. Service.
1346. J. H. Johnson.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions.

NOTICES TO CORRESPONDENTS.

The letters of Mr. Mulholland and Mr. Cheverton reached us too late for insertion in this Number, but shall appear next week. Those of Mr. Drake, Mr. Davies, Magnum Bone 'em, and others stand over from other causes.

Articles and Correspondence designed for insertion in the ensuing Numbers of the *Mechanics' Magazine* must reach the Office by the Tuesday of each week, at the latest. It is highly desirable that they should be forwarded earlier if possible.

CONTENTS OF THIS NUMBER.

LONDON: Printed and Published by Richard Archibald Brooman, of 166, Fleet-street, in the City of London. Sold by A. and W. Galignani, Rue Vivienne, Paris; Hodges and Smith, Dublin; W. C. Campbell and Co., Hamburgh.

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No. 1828.] SATURDAY, AUGUST 21, 1858. [Price 3d.

Edited by R. A. Brooman and E. J. Reed, 166, Fleet-street, London, E.C.

THE GREAT WEST OF SCOTLAND FISHERY COMPANY'S STEAMER "ISLESMAN."

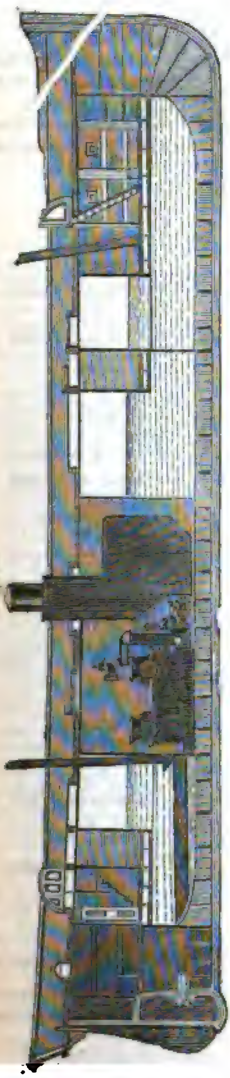


Fig. 1.

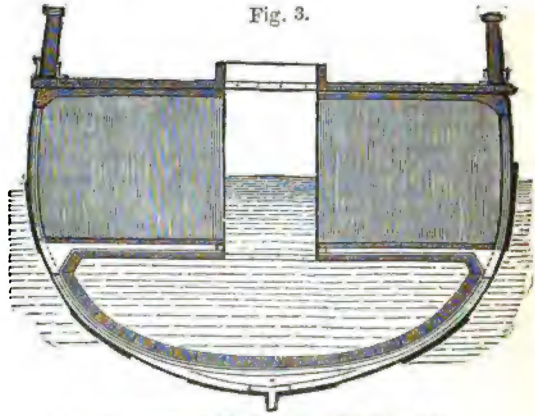


Fig. 3.

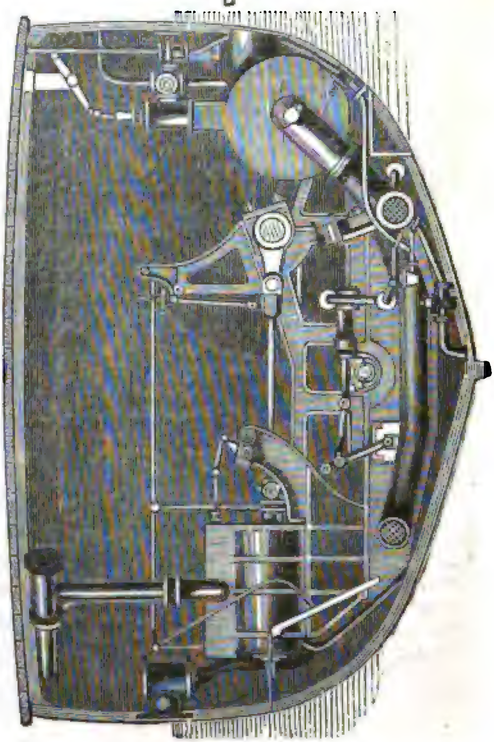


Fig. 2.

THE GREAT WEST OF SCOTLAND FISHERY COMPANY'S STEAMER "ISLESMAN."

THE Institution of Engineers in Scotland, which commenced its existence last year under the able Presidency of Professor Macquorn Rankine, with Mr. Edmund Hunt for Secretary, has published its first volume of "Transactions," which, both in form and substance, reflects honour upon the body which puts it forth. From it we derive the following:—

DESCRIPTION OF THE GREAT WEST OF SCOTLAND FISHERY COMPANY'S STEAMER "ISLESMAN." BY MR. J. R. NAPIER.

This vessel was designed for carrying live fish from distant fishing stations to market, and, as speed was not very important if the fish could be kept alive and in healthy condition for about a week's voyage, it was not thought necessary to aim at a greater rate than eight nautical miles per hour. This speed has been attained in the *Islesman*, whose dimensions are—length on the water line, 105 ft.; breadth, 20 ft.; and depth, 12½ ft. Shortness was considered to be a good quality for manœuvring in the narrow creeks, where it was possible many of the Company's best stations might be, and breadth is, undoubtedly, a good quality where the wind is frequently to be taken advantage of as a propelling power. With this in view, two masts were provided—not for appearance, but for use—with three fore and aft sails, it being considered that as these sails were so easily worked with few men they would be more frequently set and do more duty than any other kind. The Company have lately altered the rig, thinking it necessary to do so in order to deliver their cargoes above the Glasgow bridge. Still, however, the original rig has the most advantages. There is no peculiarity in the form of the vessel to require notice. The arrangements, however, for carrying the live fish are, I believe, new. Though I am not sufficiently acquainted with former arrangements of welled smacks to describe them minutely, I believe one or two bulkheads divided them into compartments, and small holes were formed in the bottom of the vessel to the sea. These compartments or wells were constantly full of water, and the circulation of the water for the preservation of the fish depended on the motion of the vessel. The water went out at the small holes when the vessel rose out of a wave, and a fresh supply entered when she sank into a wave. In calm weather, however, when there was no such motion, I understand the fishes frequently died. The arrangements of the *Islesman* were specially designed to prevent the death of the fishes in calm water, or when the steamer was at rest in a port, and also to get the full use of the vessel when there might be no live fish to carry, but plenty of dry cargo.

Fig. 1 (preceding page) is a longitudinal vertical section of the *Islesman*; fig. 2 is a transverse vertical section through the engine-room, on a larger scale; and fig. 3 is a transverse vertical through one of the fish tanks or wells, on a different scale. The vessel is divided into seven water-tight compartments—three of these are the tanks for the live fish—the mode of construction being seen in fig. 3. At the fore part of each tank a sluice opens a passage to the sea, the orifice of which has a cover formed with small holes to prevent the ingress of molluscs, &c., and the egress of the confined fishes. A large pipe from the bottom of each tank, and connected to a centrifugal pump in the engine-room, completes the arrangement. The wells at the load-water line have a capacity of about 3,000 cubic feet, and it was considered advisable to have a pump of sufficient power to discharge this volume every ten minutes, or 300 cubic feet per minute. Professor James Thomson, of Belfast, was applied to, and gave the design of a pump, which has fulfilled every expectation. This pump is seen in figs. 1 and 2, and is shown on an enlarged scale and in vertical section in figs. 4 and 5; whilst the following description, which Professor Thomson has kindly supplied, explains its action:—

Description of Professor Thomson's Centrifugal Pump.—"In centrifugal pumps, when doing actual work in raising water or forcing it against a pressure, the water necessarily has a considerable tangential velocity on leaving the circumference of the wheel. This velocity in wheels in which the vanes or blades are straight and radial is the same as that of the circumference of the wheel; in others, in which the vanes are curved backwards, it is somewhat less; but in all cases it is so great that the water on leaving the wheel carries away, in its energy of motion, a large and important part of the work applied to the wheel by the steam engine or other prime mover. This energy of motion in centrifugal pumps and centrifugal fans, as ordinarily constructed, is mainly consumed in friction, and eddies in the discharge pipe, which receives the water or air directly from the circumference of the wheel. In the improved centrifugal pump, there is provided, around

the circumference of the wheel, an exterior chamber, in which the water continues some time revolving in consequence of the rotatory motion it has on leaving the wheel. This chamber is called the exterior whirlpool chamber, and is ordinarily about the size of the wheel in diameter. The water revolving in this chamber is in the same condition as water revolving in the whirlpool, which I have called the Whirlpool of Equal Energies,

Fig. 4.

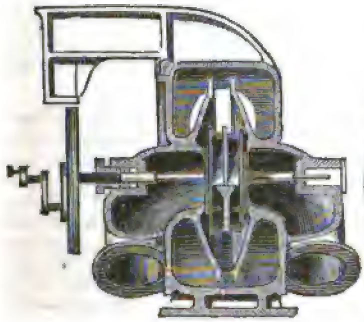
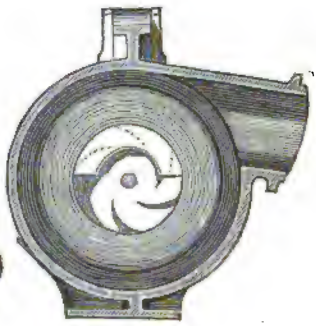


Fig. 5.



or Free Mobility. In this whirlpool (when some slightly modifying causes, such as the fluid friction, are neglected), the velocity of the water is inversely proportional to its distance from the centre, and the sum of the accumulated work or energy of motion and the work in the condition of water pressure of two equal masses of water in the same horizontal plane is the same, so that, when the velocity diminishes, the pressure increases; the energy of motion given up in the diminution of velocity being converted into water pressure. It is by this conversion of energy of motion into water pressure, through the medium of the exterior whirlpool, that a decided increase in the working efficiency of the centrifugal pump is attained; the work contained in the rapid motion of the water leaving the wheel, which in centrifugal pumps as ordinarily constructed is wasted, being in the improved pump usefully employed in increasing the pumping power of the machine. In connection with the description of the pump, it may here be added, that, in fixing on the dimensions of the pipes, it was kept in view not to make them on the one hand too large or too heavy for the convenience of the vessel, nor on the other hand too small for conveying with sufficient freedom the large quantities of water proposed to be pumped."

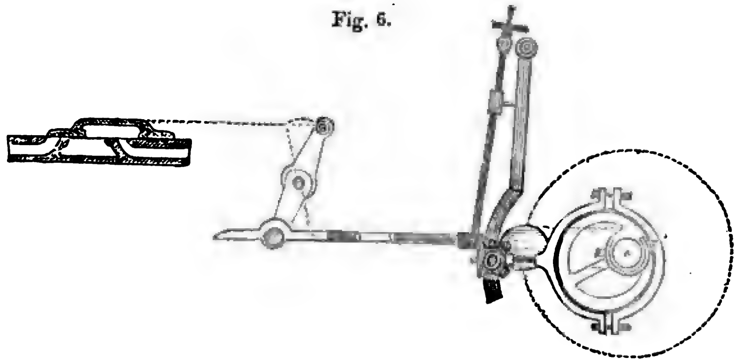
The engines are horizontal, having cylinders of 24 ins. diameter and 3 ft. stroke, with a peculiar arrangement for working expansively—the invention of Mr. Dowell, at present in the employment of Messrs. Robert Napier and Sons. It is extremely simple and complete; the lead, or opening of the valve, at the commencement of the stroke, is constant, or nearly so, and the amount of steam admitted when the piston has travelled equal distances from either end of the cylinder is nearly equal, whilst the amount of expansion can be varied with great ease by merely turning a screw. Mr. Dowell has kindly supplied the following description:—

Description of Mr. Dowell's Gear for Obtaining Variable Expansion with Equal Distribution of the Steam.—" In this arrangement, the variable expansion is obtained by operating on the steam slide valve of the engine, so as to vary the travel, the lap, and in this case the lead also, remaining the same for all the different travels. The ordinary single eccentric, with its appendages of catches, gab, and starting bar, is retained, whilst a curved lever is introduced, and the usual eccentric rod reduced to a length of about 2½ times the throw of the eccentric, its end being connected to the lever. The curved part of the lever is constructed with a radius equal to the length of the eccentric rod, and is furnished with the means of traversing the eccentric rod pin to any part of the arc at pleasure, the admission being increased on its approaching the fulcrum, and *vice versâ*. This is effected in the simplest manner, by means of a screw and hand wheel attached near the fulcrum of the lever, and acting on the slide. A pointer is fastened on the screwed rod to indicate the grades of expansion. The motion is transmitted to the valve by attaching the gab rod to any convenient point of the lever, generally about the middle of the arc.

" In fig. 6, the mechanism is shown in a position to correspond with the crank on the dead point, the piston being about to commence the out-stroke. The valve is shown with the opening for admitting steam sufficiently advanced to give the desired lead. The

arc of the lever is constructed, as already mentioned, with a radius equal to the length of the eccentric rod, and in its present position the centre of the eccentric is also the centre of the arc. It will be plain, therefore, that the slide attached to the eccentric rod joint can pass from one end of the arc to the other without disturbing the lever or valve, and

Fig. 6.



consequently with the lead remaining unchanged. Suppose now the crank to have travelled to the other dead point for the commencement of the in-stroke, it will have moved through exactly a semicircle, and will therefore be diametrically opposite to its former position. As the eccentric's motion is similar to the crank's, its new position will likewise be diametrically opposite to its first. Let E, E′ be these two positions. On the line F O, drawn from the centre of shaft perpendicular to the diameter passing through E E′, place the fulcrum of the lever at such a distance from the shaft as will be presently explained. It may, however, be anywhere on the line F O, as far as variable expansion is concerned. Suppose it placed, for the present, at F: then from F, as a centre, describe an arc of a circle, passing through the points E, E′; then, into whatever position the lever moves, the centre of its arc will always be found in this circle; and, on the arrival of the eccentric at E′, both the centres will be found exactly at the same point, so that the eccentric rod can slide from end to end of the arc, as at E, without disturbing the lead.

"It was stated already that the admissions varied as the travels. This, however, is not literally correct, for the lever can be of any length, provided the fulcrum be on the line O F, and, if infinitely long, the travels would be equal for every grade. Correctly, then, the admissions of steam vary as the angles which lines drawn from the centres of the eccentric pins on the lever to the centre, O, make with the radius lines of the eccentric, when in the position E or E′. These angles may easily be found by the methods usually adopted for setting the valves of ordinary engines with a single eccentric.

"As regards the equal distribution of the steam, this requirement is accomplished by prolonging the lever to a greater length along O F than would give travels proportional to the admissions, as in the ordinary link motion. In consequence of this prolongation, the angle of the eccentric for the in-stroke is increased by a considerable amount, whilst that for the out-stroke is diminished by about the same amount. This variation in the angles of the eccentric is followed by a corresponding modification in the angles moved through by the crank until suppression occurs, amounting to an increase of twice the small angle for the in-stroke, and a diminution of twice the other angle for the out-stroke. This result exactly suits the angles moved through by the crank for the in and out strokes, the former being considerably in excess of the latter for the same positions of piston.

"It may be noticed that the prolongation of the lever to the extent shown in the diagram has no equalizing effect on the admission at points in the lever corresponding to admissions of three, two, and one-tenth of stroke, the fulcrum being nearly at right angles to the centre line of motion at $\frac{3}{10}$ths grade. These grades are easily managed by a slight alteration in the lead, being made to increase from $\frac{0}{10}$ to $\frac{1}{10}$ for the in-stroke, and to diminish from $\frac{0}{10}$ to $\frac{1}{10}$ in the out-stroke, the change of lead to effect a close enough equality being $\frac{1}{8}$ inch in each case.

"This change is accomplished by having the centre of the lever arc in a circle about $\frac{1}{4}$ inch farther from the fulcrum than the one passing through the points E, E′. Besides

equalizing the admission, this variation of lead is useful in equalizing the openings which would otherwise be less for the in than for the out stroke at these points.

"The accompanying table exhibits the distributions and leads as arranged for the *Islesman*—the points of release and compression being also recorded:—

Points of Suppression; being a mean of both sides, in tenths of stroke.	Distribution; giving the distances travelled by piston at supp. for both sides.		Leads.		Release; measured from end of stroke.		Compression; measured from end of stroke.	
	In.	Out.	In.	Out.	In.	Out.	In.	Out.
	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
6	21	22	$\frac{1}{4}$	$\frac{1}{4}$	$3\frac{1}{8}$	$3\frac{1}{4}$	$5\frac{7}{8}$	$5\frac{7}{8}$
5	$17\frac{1}{8}$	$18\frac{7}{8}$	$\frac{1}{4}$	$\frac{1}{4}$	$4\frac{1}{4}$	$4\frac{1}{4}$	$7\frac{1}{4}$	$7\frac{1}{2}$
4	$13\frac{5}{8}$	$15\frac{3}{8}$	$\frac{1}{4}$ full.	$\frac{1}{4}$ bare.	$5\frac{1}{4}$	$5\frac{1}{4}$	$9\frac{1}{8}$	$9\frac{1}{8}$
3	10	$11\frac{7}{8}$	$\frac{5}{16}$	$\frac{3}{16}$	$6\frac{1}{4}$	$6\frac{3}{4}$	11	11
2	$6\frac{3}{4}$	$8\frac{1}{4}$	$\frac{5}{16}$ full.	$\frac{3}{16}$ bare.	$7\frac{7}{8}$	$8\frac{1}{2}$	$13\frac{1}{2}$	$13\frac{1}{8}$
1	$3\frac{3}{4}$	$4\frac{1}{4}$	$\frac{3}{8}$	$\frac{1}{8}$	10	11	$16\frac{1}{2}$	16

"The length of the connecting rod of the engine in this case was four times that of the crank. It is plain that the shorter the connecting rod is, the more difficult it is to equalize the distribution, as it requires a greater length of lever. For the usual proportions of connecting rods and cranks in marine engines, a distance from centre to fulcrum of about twice the length of the eccentric rod will be found to give distributions practically correct. In the *Islesman* it was 1·9 times, but it would have given a better distribution if made twice the length, which, however, could not be conveniently accomplished in the arrangement. In oscillating engines, for which the scheme is extremely well adapted, and in other vertical engines, it is not desirable to arrange the distributions perfectly equal; a sufficient excess of admission is usually given to the lower side of the piston to cause the difference of mean pressure in favour of the lower side to be exactly equal to the unbalanced weight of the piston, rod, &c.; but in horizontal engines, and more especially in those intended for high speeds, there is nothing conduces more to their perfect action than having the distributions as equal as possible."

The engine is connected to the propeller by a wheel and pinion, so as to multiply its revolutions. As regards giving the propeller the same speed as, or a higher speed than, that of the engine, I am aware there are great differences of opinion, but, as I believed that the most efficient vessels were those with short-pitched propellers, of such a diameter as not to churn the water, from the upper portion being too near the surface, the Company were advised to adopt the wheel and pinion. The diameter of the propeller is 6 feet, and the pitch 6·5 feet, and, when the engine makes 70 revolutions per minute, it makes 172·3.

The windlass may be noticed as a revival of an old form, and I am sure it will be admitted by those conversant with the patent articles usually supplied to ships for raising and lowering their anchors, that a mechanic might turn his attention to the subject with great hope of making a more efficient machine. The *Islesman's* is submitted as simple and efficient. The chain barrel is small, and the wheel large. The motion is regular. The space it occupies is small, and by means of the friction-break the anchor can be lowered at any velocity the captain pleases. There is a paul on the large wheel, and the chain stopper is a flap or valve on the inside of the hawse pipe.

I have already mentioned that the vessel was divided into seven water-tight compartments, and supplied with a pump capable of discharging at least 300 cubic feet of water per minute. Notwithstanding the great safety of such arrangements, the Fishery Company were obliged to have the after part plated over, and made water-tight, and two of the wells or tanks shut up, ere the surveyors of the Board of Trade would grant a licence to carry passengers.

HILL'S PATENT FOR PURIFYING GAS.—We are compelled to defer the report of the trial in respect to this patent till next week.

ON WAVES AND CALVER'S WAVE SCREEN.

(Concluded from p. 150.)

We cannot enter upon the highly interesting chapter on breakwaters which Mr. Calver here gives. The following are the conclusions to which he is conducted; viz., that "*breakwaters in their construction* should be free from those defects of principle which subject the long-slope to constant wreckage from the direct and oblique strokes of the wave.

"They should partly produce the effect of the upright-wall, without involving its drawbacks of costliness and imperfect construction.

"They should possess continuity—a property belonging neither to the long-slope nor the upright-wall, where the weakest part is the measure of the strength of each structure.

"They should be inexpensive, so as to admit of their being established in every situation where shelter is required, and where the nature of the frontage will admit of its being afforded.

"Their construction should be of such a nature as to admit of their being inspected and repaired when necessary.

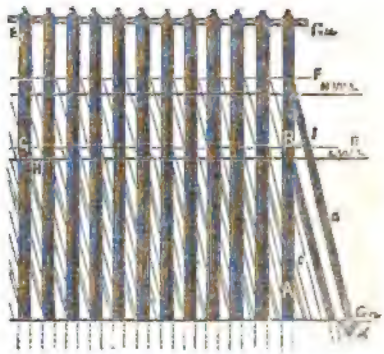
"And, unlike the long-slope or the upright-wall, they should be capable of removal in case of faulty projection or a change in local conformation, such changes in nature being of frequent occurrence.

"*Breakwaters in their projection* should be arranged more with the view of forming a protected roadstead, which is wanted, than a close harbour, which is not wanted, and which, as we have seen, is defective in principle and destructive in practice. To this end, breakwaters should be projected so as to ensure the unobstructed passage of the tidal streams—the destruction of the surface-breaker, and the interception of only so much of the deep-water undulation as may be necessary for the security of the vessels anchored within their protection."

These several objects Mr. Calver proposes to attain by means of his "Wave Screen," which is represented in the annexed engraving.

This structure, from the nature of the work to be done by it, is arranged for a low-water depth of 36 feet, a tidal rise of 15 feet, and a wave of 15 feet. It consists of nine principal parts, viz., A A and B B, lower and upper courses—C and D, lower and upper stays—E and F, lower and upper ties—G and H, lower and upper link bars—and I, the stay chain. The foot of each stay is furnished with a heavy shoe, as K in diagram (fitted so as to be perpendicular to the plane of the ground), to be buried beneath the surface by the action of the tidal current, while the ties are fitted with moveable flanges to secure the various sections of the screen in their places, and to provide against irregularities of distance.

Fig. 1.



(*Ga* is the gangway; *Gr*, the ground line; H W L, the high-water line; and L W L, the low-water line.)

The materials to be used for the construction of the screen are pine scupper-nailed, or pine cased in green-heart, or wrought-iron cylinders, for the lower course, and either cast-iron or wrought-iron cylinders for the upper course, and for the upper half of the longer stays. The ties, flanges, link bars, stay chains, and shoes would be of wrought iron. The lower course of piles or cylinders would be driven 10 feet into ground consisting of clay or sand; but, in the case of a thin layer of soil over a hard substratum, then another mode of fixing and securing the lower course would be adopted. The lower course would be driven by a floating pile driver, or, after a few sections had been so placed, the construction of the work would be proceeded with either from a travelling platform resting upon it, or from a common staging as at Portland, as circumstances might render desirable. The direction of the screen would be in the line of the tide streams at their greatest strength, as far as that direction was consistent with affording the required shelter to vessels. The intervals between the sections of the screen, which it is intended should admit exactly half the external undulation when advancing from abreast, would be determined by experience during the progress of the work.

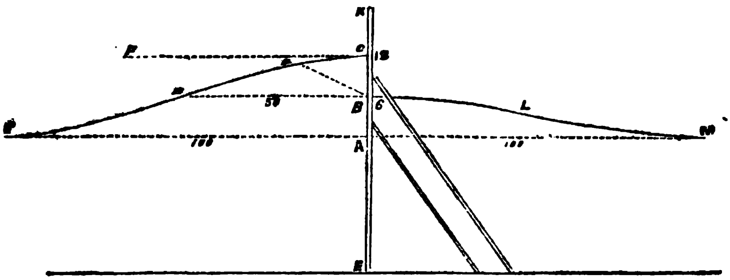
The diameter of the lower and upper courses, being regulated by the depth of water and weight of sea, would, for a screen in a low-water depth of 36 feet, be

20 inches, and that of the lower and upper stays 15 inches: the iron of the cylinders would be at least an inch in thickness. The junction of the lower and upper courses of the screen would generally be 3 or 4 feet above the low-water level, while the height of the summit of the screen above high-water springs would depend on the maximum height of the wave.

The form of the various parts of the structure would be cylindrical, that it might the more easily resist the broken crests of deep-water waves, or the batter of artillery, while the employment of iron for the upper portion would render it equally independent of fire.

The screen would carry a gangway along its summit, and be lighted at night.

Fig. 2.



The first consideration respecting such a work must embrace the nature of the forces to which it would be exposed, and the resistance possessed by the work. It has been already shown that a deep-water wave undulates against an upright object; hence, it would undulate against the screen. The influence, therefore, which the undulation and its broken crest would exert upon the screen is that which is required to be known.

The illustrations which have been given show that the screen would not be subjected to percussive force. "If the particles in proximity to the screen, H K in fig. 2, undulate vertically between A and C, and never move towards it, how," asks Mr. Calver, "can they administer a stroke to the screen? If, as has been observed, the undulation was really a body of water advancing with the rapidity of the wave itself, then its percussive force, like that of a solid, would be in proportion to its momentum; but it is self-evident that there can be no stroke against a perpendicular object in the absence of any horizontal motion! Nor is it hydrostatic pressure, which pressure is equal to the weight of a column of water whose base is the surface pressed, &c.; this pressure is that sustained by dock gates with a head of water on one side of them, and which pressure, allowing H K, in fig. 2, to represent the gates, would be conveyed in horizontal lines as F C, a direction, as will be perceived, different from that of E D G C, the containing or bounding line of the undulation. If, then, the influence exerted by the wave be neither percussive force nor hydrostatic pressure, what is it? Upon going carefully into the question of the nature of the undulation, it seems but fair to infer that the screen opposed to it would only be partially subject to the *weight* of that portion of each undulation due to the difference between the levels of the water on the seaward and landward sides of the screen. The incumbent water on the exterior side of the screen would require support in proportion to its height and width, and the screen would supply the necessary resistance to give that support. There is an analogy between a fluid and a solid in this particular, for the water would rest against and be upheld by the screen, somewhat in the same way as a log of wood, or other material, inclined from the perpendicular would rest against and be upheld by a wall, or other supporting body; with this difference, that, whereas the whole log bears with a part of its weight upon the wall, only a portion of the exterior and intercepted fluid bears upon the screen, for reasons which will be stated presently. This being admitted, then the weight of any given height of water resting against the screen may be arrived at by considering the alteration of form and the various changes to which the undulation would be subjected by the interposition of a partial barrier like the screen. Here a considerable degree of attention is necessary, as the soundness of the proposal will entirely depend on the accuracy of the inferences which are to be drawn—it is only by induction that we can arrive at the truth, for, as Smeaton said in allusion to waves at the Eddystone, their power is subject to no calculation."

It has been mentioned that the intervals

between the various sections of the screen would be of the required width to admit of the passage of half the undulation when approaching from abreast; that is, supposing a 12-feet undulation to arrive at the screen from seaward, only so much of it would pass or fall through the intervals of the screen, as would form a wave of 6 ft. on its landward side. In fig. 2, for instance, as the wave E D G C was gradually rising on the seaward side of the screen from A to C, a height of 12 ft., the water which passed or fell through the screen should, in the same time, raise the level from A to B, a height of 6 ft., on the landward side of the screen, and the direct effect in such a case, therefore, would be to reduce the undulation E D G C to the undulation B L M, or to half its former size. As the weight of water resting against the screen would depend on the difference of the water-level upon its two sides, it follows, therefore, that, of the 12-ft. undulation, only that portion of E D G C which is above the horizontal line B D, the level of the summit of the inferior undulation, would exert upon the work any of the pressure due to weight.

The length of a 15-ft. wave is about 200 feet (which would also be its length when reduced in height to 12 ft.), and half of this length, or A E, being 100 ft., would give for the triangular space of water D B C above the horizontal line D B, a base of 50 ft., and a perpendicular of 6 ft., which, with a breadth of 20 ins. (the diameter of the cylinder), represents a weight of 7 tons nearly. Now the water within this space is not like that contained within a vessel, where there is an equal pressure downward and sideward—here, gravitation alone acts, and, as this is necessarily in a vertical direction, it will be evident, upon projecting the figure, that by far the greater portion of the water contained within the triangular space D B C would be resting upon the base D B, and not against the perpendicular B C. The quantity actually exerting any of the influence of weight against the perpendicular, or screen, B C, can only be arrived at by inference; and, admitting that one-quarter of the water within the triangular space alluded to would have a tendency to rest against the screen (and this is evidently far in excess of the fact), it reduces the quantity to about 1¾ tons. It is clear, however, on the slightest reflection, that on account of the action of gravity the screen would not be subjected to the dead weight of the water contained within this reduced space, on the same principle that, if the inclined log be lifted away from the wall, it will be found that the latter has only been supporting a small portion of the actual weight of the log; each cylinder, in short, would only be subjected to the "push" of the mass, and not to its whole weight. Accordingly, the foregoing estimated quantity may again be reduced by one-half, which gives seven-eighths of a ton as the approximate weight of the water which rests against or is supported by each section of the screen. This, though very nearly, is not quite the whole of the case, and we must here make use of another diagram:—

Fig. 3.

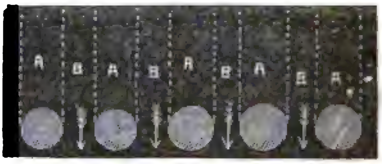


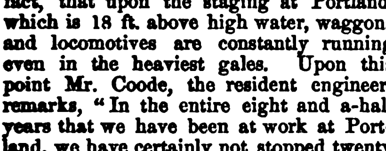
Fig. 3 is a bird's-eye view of a portion of the screen, A and B representing alternate sections of the undulation on the seaward side of the screen; the water within the spaces A would rest against or be sustained by the cylinders, while that within the spaces B would pass through the intervals of the screen, and form the reduced undulation within it. Though the particles of water move among each other freely, yet the filaments passing through the intervals of the screen from the spaces B would have a natural adhesion to the water in the spaces A, and the effect of the friction arising from such adhesion would be to add somewhat to the weight of water resting against the exterior side of the screen. What that addition would be could only be determined by experiment, but that it would be too trifling to materially affect the estimated quantity resting against each cylinder, may be proved by analogy. If, for instance, on a windy day, the reader had a person standing closely on each side of him in a direction transverse to that of the wind, he would feel but little extra pressure of the wind in consequence of their neighbourhood; and the same rule holds good whether the fluid be air or water. This effect of the passing water has only been alluded to to show that the point has not been overlooked.

Less than a ton would therefore be a close approximation to the weight of water resting against each cylinder of the screen, but individually and separately they would be equal to the support of several tons; and, when it is considered that their power would be increased many-fold by the combined support of the adjoining sections, and by the continuity of the work, it will be evident that the power of resistance pos-

sessed by the screen would greatly outbalance any force which could possibly be brought against it. It must also be borne in mind that there is no analogy between the screen and the boats and bulwarks of a ship, for the broken crests of the deep-water wave would be powerless against a structure presenting no long line of resistance, and which would permit the sea to play freely round its parts. Sunderland beacons, for instance, spars stepped in the rock, 33 ft. long, and without stay or support, resist unharmed the bursting sea of the heaviest gales. The extent of immersion, also, would render the screen nearly independent of the surface stroke, on the same principle that a pole buried well in the earth is better fitted to resist the pressure arising from sudden gusts; the parallel, though not exact, is sufficiently so for the purpose of illustration. That the summit of the screen, also, which it is intended should be 19 ft. above high-water springs, would be sufficiently clear of the surface lash and spray, will be evident from the fact, that upon the staging at Portland, which is 18 ft. above high water, waggons and locomotives are constantly running even in the heaviest gales. Upon this point Mr. Coode, the resident engineer, remarks, "In the entire eight and a-half years that we have been at work at Portland, we have certainly not stopped twenty days from bad weather."

The intervals between the sections of the screen, as has been mentioned, would be of the required width for admitting half the undulation when it advanced direct upon the barrier, but when its advance was oblique to the line of the screen the interception would be increased in proportion to the obliquity; and it will be evident at a certain angle (depending on the width of the intervals) the screen would present no spaces, when the interception and deflection of the undulation would be nearly as complete as if the screen were a continuous

Fig. 4.



wall. The angle of complete interception for the various openings is shown in fig. 4, where A, B, and C represent, respectively, whole, three-quarters, and half intervals.

From the foregoing facts and inferences, in which we have rigidly followed Mr. Calver's remarks, it will be clear, that, while the stability of the screen would be amply sufficient to bear and deflect the deep-water undulation and destroy its crest, the summit of the work also would be above the influence of the heaviest sea.

The screen would always be formed in the line of the core of the tide-streams, in accordance with the governing principle of its construction and projection, namely, the interfering as little as possible with the natural agencies so as to insure permanency of depth, a principle entirely disregarded in the formation of a close harbour, where mechanical action is intercepted and set at nought. The principle of the screen would, as we have seen, secure a sufficient degree of undulation and the unrestricted range of the current over the refuge harbour enclosed by it, and so far approaches very closely to the idea of a perfect harbour as described by Sir William Cubitt in his evidence upon Dover. Such harbour ought, he says, "to have the openings large enough, so that there might be both a run of tide through it and sufficient action to have the properties of a good harbour as a roadstead harbour, and sufficient motion to keep it from filling up, and that is the point to which the whole essence of harbour making must be directed—so that it will not fill up, and so that it will be quiet enough."

The appearance of the sea in gales has no doubt led to the idea, that nothing less than massive stone barriers are equal to resist its force, and the substitution of a wave screen for a stone breakwater, as the result of a calm consideration of the *rationale* of a wave, would be, as it were, to put a child to do the work of a giant, and to do it much better.

In a refuge harbour, the repose which is necessary in a dock for trading purposes is not wanted, but only shelter from the tempest. It is necessary that it should possess ample space, and be so projected that vessels of the largest class would be enabled to enter and ride safely in it under all circumstances of tide, wind, and weather, and that there should also be equal facility for quitting it; the matter of tranquillity is altogether secondary. Now the refuge harbour formed by the screen would, the author considers, furnish a roadstead like that at Yarmouth, without the objectionable features of the latter; for, whereas the roadstead in question is only comparatively smooth towards low water, when the breakers expend themselves upon the covering sands, the refuge harbour would be equally affected at every period of the tide from the uniform operation of the screen, and it would also have an advantage over the roadstead in affording less space for the surface-crest to re-form.

Entrance to a refuge harbour thus formed would be either round the ends of the screen or through an interval left in it, according to circumstances; in the latter case, vessels taking refuge would have the inestimable nautical advantage of being able to pass into the body of the harbour without touching brace or sheet, instead of having to present their broadsides to the sea.

It has been estimated that a wave screen with a lower course of pine scupper-nailed, and upper course of cast-iron cylinders, formed in a low-water depth of 36 feet, would cost as follows: viz., with intervals between the sections equal to the diameter of the cylinders, £200,000 per sea mile; with three-quarter intervals, £225,000 per mile; and with half intervals, £250,000 per mile; and under common circumstances it would occupy two years to construct a wave screen a mile long, and to form a harbour of refuge.

We here leave the invention of Mr. Calver. The volume contains many other important considerations respecting the wave screen, and we warmly recommend it, not only for the sake of those considerations, but because of the elaborate and careful manner in which the nature and actions of waves are treated in it.

WHETTEM'S BELL BUOY.

A new bell buoy has been invented by Mr. Whettem, the son of the master mast maker in Portsmouth Dockyard. The buoy appendages invented by Peacock and others, for the purpose of warning the mariner of his proximity to danger, have this serious disadvantage—the hammers used to strike the bell remain upon it for a short space of time, thus stopping that vibration which is so necessary for the production of a clear ringing sound. Mr. Whettem's plan is devised to obviate this difficulty. The hammers used by him are two quadrants so fixed as to strike the bell alternately, as the buoy to which it is affixed is set in motion by the action of the waves. The necessary motion is given to the quadrants by a shot traversing a cylindrical chamber, and by its momentum striking the lower end of the quadrant with sufficient force to make the upper end strike the bell, but immediately upon doing so the quadrant returns to its original position, the centre of gravity being below the point of suspension. On the return of the shot to the other end of the cylinder a similar action takes place with the other quadrant, and so on continually. The result is a loud and clear ring, which can be heard much farther than the sound of any other bell. It has also the advantage of giving its warning note to the seaman even when the motion is no more than that caused by the roll of the sea. This would render it invaluable in foggy weather. A model of the invention has been inspected by the Admiral Superintendent, and other officers of the dockyard and of the navy, all of whom express their unqualified approval of the arrangement.

We are happy to find that a buoy fitted with Mr. Whettem's clever invention is to be forthwith placed on the S. W. Shingles. We have inspected the buoy in Her Majesty's Dockyard at Portsmouth, which is quite ready, and will be despatched to its station in a few days. The striking action of the bell is singularly active, the least rolling motion given to the buoy producing a blow of the hammer against the bell; the blow, too, being given with so much smartness as to bring out the fullest sounding powers of the bell.

GEOLOGICAL DRAINAGE.

Gentlemen,—Absence from town has unfortunately prevented me from noticing ere this the communication in a recent number of your valuable journal from a Mr. Richard Jex Crickmer, respecting his alleged discovery of "A New Method of Draining London." It appears that your sapient correspondent, without inquiry or being possessed of any practical knowledge (as I shall prove), feeling, as he states, "confident of ultimate triumph," has deliberately trumpeted forth a challenge defying "all the engineering and scientific skill, &c., to scrutinise and examine his plans." Bravo, Crickmer! a very good move as regards position, but subject to checks, and here they are!

Allow me to preface further remarks by observing that I have the honour of belonging to that unfortunate class sneeringly castigated by Mr. Crickmer for not studying or overlooking a science as absolutely necessary to the practical engineer as meat and drink are to the support of the human system; it is, therefore, while writing, my province (on behalf of self and professional brethren), to assure that gentleman, with all due deference, that the majority of English civil engineers are really and truly both geologists and chemists, and not quite so daft as he appears to think them. The modest assurance, however, of Mr. Crickmer, in publicly expressing his confidence "that all have been at fault in not dealing with the matter naturally," renders it necessary for me, by the following observations, to treat that gentleman in a precisely similar manner to that in which he proposes to handle the subject.

In the year 1806, my late father (being largely interested in the question of dock accommodation and the improvement of the Thames navigation) prepared, at considerable expense, and exhibited designs for embanking, dredging, and sewering the metropolis, and subsequently, in 1816 (he, from his long and varied experience, being an acknowledged authority on this subject), professionally assisted Sir F. French in the production of sundry schemes with the same object in view. My first practical essay in geological engineering was in 1830-1, when I proposed and conducted important and successful drainage operations by penetrating the underlying porous strata, and removing by percolation abundant supplies of land water from the Government quarries at Hobarton, Van Dieman's Land, and in 1837 I was similarly engaged in the island of Ceylon. In 1839 I devoted considerable time and attention to the embankment and sewerage question, and was engaged several months making a general survey of the Thames, taking geological and other notes, but had not faith to print them until 1842, when they appeared in opposition to the late John Martin's scheme. In 1846, I designed and laid before one of our most eminent hydraulic engineers my plan of sumpts sunk into the chalk formation, as being the readiest and best means for disposing of sewage, and, in the following year, had the honour of carrying into effect, under the auspices of that gentleman, the (I believe) first practical application of the kind in this country. Subsequently, I have constructed many others in various parts of the United Kingdom, and still continue to lecture upon and apply my system generally to the various stratified groups with invariable success, yet am not too proud to acknowledge that my ideas in this respect have been and are based upon facts acquired by reading, when a schoolboy, "Macartney's Embassy," wherein the particular systems of sinking and boring commonly pursued by the Celestials are described, proving them, as usual, to have been in possession of full information on the subject for many centuries. With the foregoing works as precedents, in conjunction with a mass of collected data in hand, after acquainting myself with the plans and schemes offered from time to time to legislative and public notice, it will readily be understood how and why I have recently been induced to go over the ground again, and prepare plans, chemical reports, &c., of a novel and original character for the information of Her Majesty's Government and the use and behoof of the metropolitan population generally. The long-pending question between Her Majesty's late Chief Commissioner and the Metropolitan Board of Works, the many eminent men engaged in the controversy, and the announcement that the subject would again be brought before a Parliamentary Committee, seemed to offer the long-sought-for opportunity of making my views public; but, alas! when the time for inquiry arrived, the subject proved to be (in more senses than one) so truly unpalatable to hon. members, that they hastily brought the matter to a close without taking a tithe of the evidence offered. I, therefore, on the 30th of June, forwarded to the Right Hon. Lord J. Manners my drawings, accompanied by geological, chemical, and tabular appendices, the receipt of same being acknowledged by that nobleman's department on the 5th ult., and informing me that all suggestions should be addressed to the Metropolitan Board, in order that they might meet with proper attention. I have delayed doing so, in order that I might observe the effect produced by the application of lime to the sewage, and ascertain what results were to be anticipated from the proposed Government measure; consequently I was much surprised to read the inventor and patentee's description of a scheme identical to a great extent with my own. I have herein endeavoured to prove my practical acquaintance with, and the interest I have for so many years taken in, the subject; and the following brief description will, I trust, afford you and your readers a tolerably correct idea of the very singular similarity existing between my own and Mr. Crickmer's plan.

1. I propose to allow access for fæcal and solid matter only to the sewers, to remove all the air vents, seal the manholes, and connect the gullies with the rain-water conduits.

2. I divide the whole of the metropolitan and suburban districts into blocks, separating the high from the low levels.

3. I avail myself in all cases of existing drains and sewers, conveying the sewage to air-tight sumpts (sunk into the chalk strata), and consuming the gases (as generated during the putrefying process) in a furnace erected over the head of each.

4. I propose having double sumpts at each station in one compartment. I allow the fæcal and other solid residuum to precipitate until full; the supernatant water passing off through overflows into properly arranged filters, and from thence, colourless and without smell, through the rain-water drains to the river.

5. I propose mixing the contents of the filters with the residuum of the sewage, and furnishing the agricultural community with a highly fertilizing, solid, inodorous, and portable commodity, thus getting rid

of the only real difficulty in the case, and realizing a profit on expenditure, applicable to the reduction of rates or general improvement purposes.

The estimated cost of constructing stations, &c., for collecting, deodorizing, and manufacturing the sewage refuse of London and suburban districts by my plan is under £500,000!

Having promised, when I commenced writing, to prove Mr. Crickmer to be a mere theorist, I with all due deference do so by calling the attention of your practical readers to the following trifling matters, evidently not studied or overlooked by him.

1. No provision is made for getting rid of the noxious gases in the sewers, or destroying the malarian effect of the exhalations arising from his deodorizing pits, shafts, &c., the latter being nuisances that could not be tolerated in the vicinity of, much less in any part of, the metropolis.

2. Mr. Crickmer evidently has no idea of the quantity of sewage to be contended with daily (otherwise he would not mention pipe communications); yet, assuming (for argument's sake) the deep shafts shown in his published diagram to be only 15 feet in diameter, and driven 150 feet in the chalk, the cost of each station would not be less, on the average, than £15,000, and with adjuncts, say, £20,000 (not including turbines, pumps, fountains, and other wimwams); then, after allowing two main-sewer connections to each, we arrive at the following interesting result—20,000 × 215 = £4,300,000, instead of less than £1,000,000.

3. I have no doubt the Jermyn-street authorities will duly appreciate the value of Mr. Crickmer's geological diagram, but, unfortunately, one fact fatal to the practicability of his scheme intrudes itself—that is, the chalk formation does not and will not "absorb any amount of liquid." Facts being stubborn, further comment is needless.

In conclusion, I believe no right-minded person will consider Mr. Crickmer justified in arrogating to himself the origination of a geological scheme for effectuating the metropolitan drainage; this, however, being a matter of opinion, I leave it for your readers to decide upon, merely remarking that the question is one of considerable importance as between the actual originator of a particular plan and the patentee of another man's ideas.

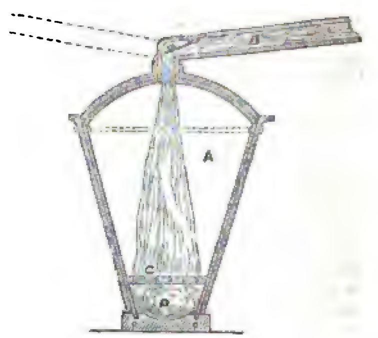
I am, Gentlemen, yours, &c.,
F. G. Mulholland, C.E.

22, York-buildings, Adelphi, W.C.,
Aug. 6th, 1858.

THE DRAINAGE OF LONDON.

Gentlemen,—We have a right to presume the present existing agitation relative to the contaminated state of the Thames will be productive of some recognised improvement; but the Board of Public Works will have to remove various retarding obstructions before they can hope to accomplish that good so anxiously anticipated. Party, political, and municipal patronage and prejudices must no longer be permitted to crush impartial investigation; and that impeding selfish principle, "There is nothing like leather," must also be kept in due subjection before they can proceed with the important undertaking committed to their care, in a way calculated to produce the best results.

Thirty-seven years since, in the year 1821, ventilation, draining, street, and river improvements first occupied my attention. My late improvements, embracing the disposal of the sewage, I now beg to bring under your notice; and, if it be permitted to receive the consideration of those charged with improving the metropolis and its once pure river, it is possible that, if not wholly, it may be partially adopted. Instead of the present system of constructing sewers of brick, I proposed to construct them of cast iron, of small capacity, of the same material as water-pipes are now frequently made, or of slate. The engraving represents a section of the middle-size sewer, with the drain pipe through which the sewage is conducted into the sewer, A, the



self-acting valve in the pipe, B, cutting off the communication between the closet and the sewer when the pipe is discharged. This sewer is made in detached parts, so fitted, as duplicates in casting, that any part can be removed and replaced without disturbing those adjoining. C is a perforated shifting plate through which the sewage passes into the gutter, D, which conducts it to the cess-pit or vessel at the mouth of the sewer. It is introduced to prevent the

flooding in heavy rains from diluting the sewage, the sluice water passing freely above the cess-pan into the river, as unmixed with the more ponderous deposit as it well can.

The rain water from the streets is also conducted into the sewer through pipes in the same way; and, when an additional pipe is required, the plain cover plate of A is changed for one with a hole to receive the pipe without disturbing more of the paving than will be required to remove it and to introduce the pipe; and at certain places, to enter the sewer, a brick or iron entrance may be made directly above the sewer, and covered with an iron plate also; and, if it be desirable to ventilate the sewer, pipes in the same way may be introduced without the valve, and passed up in the front of a house above the roof, the same as water spouts are now fitted; or, if more agreeable, at the back instead of the front of the houses.

Relative to the cost of iron sewers thus made, of the same capacity, they probably will not be so expensive as brick, and the facility with which they can be introduced and kept in order will make them extremely desirable for London. As the sewage will pass through this more freely than through sewers as now made, the deposit will be less offensive at distances from the river, and the discharging may be so arranged as to remove the baneful effects experienced by those residing within the vicinity of its mouth; but I find that I have intruded too much on your space, and request the favour of being permitted to explain in which way I propose to remove the noxious contents in a subsequent letter.

I am, Gentlemen, yours, &c.,

JOHN POAD DRAKE.

London, Aug. 5th, 1858.

SMOKE AND SEWAGE.

GENTLEMEN,—While so many projects have been set on foot for getting rid of the nuisances of smoke and sewage, it has been overlooked that both might be removed by one process.

Carbon, of which smoke chiefly consists, has long been well known to be a very purifying and deodorizing substance. Tainted meat treated with charcoal may be restored to purity.

Now, it has never struck any of the projectors, that, instead of building tall and expensive chimneys for the draft of smoke, the latter might, wherever a steam engine is used, be blown into the nearest sewer, through a pipe attached to the furnace, instead of a chimney by bellows, or pistons, or any other blowing contrivance, into which it might be drawn after leaving the fire; or the air might be blown into the fire, as in the common case of bellows, so as to force the smoke into the pipe leading to the sewer. Traps should, of course, be placed in the street, wherever an opening appeared, in order to prevent the smoke from escaping until it reached the river or other open place. But the greater part of the carbon would probably be deposited in the sewer until rain should wash it out, and in the meantime it would correct or annihilate the offensiveness of the sewage matter. The expense would be more than paid by the exemption from the necessity of building chimneys.

While on this subject, I may allude to another matter connected with it. Growing plants in water have a very purifying effect on the latter. It was stated lately, by Dr. Lankester, in a communication to the *Athenæum*, that if the bed of the Thames could be covered with vegetation the water would become quite pure in a few days.

A plant has lately been introduced from Canada, a species of Anacharis, which has the property of growing most luxuriantly along the bottoms and sides of rivers, to such an extent that some querulous persons have called it a nuisance where it is found, by reason of its stopping the course of fish, &c. It is now growing thickly on the bottom of the south branch of the river Lee, near Cork, and of another small branch through which the tides ebb and flow, notwithstanding the brackish and sometimes the salt condition of the water. It has also been introduced in some rivers in England.

Surely it would seem that the Thames might be purified by the introduction of this plant more effectually than by any other means.

I am, Gentlemen, yours, &c.,

T. T.

CONTAMINATION OF THE THAMES AND OTHER RIVERS.

GENTLEMEN,—All the suggestions proposed with reference to the purification of the Thames will evidently cost an enormous amount of money, and almost all propose sacrificing the invaluable manure. With your permission I would beg respectfully to suggest the formation of cess or catch pools in the line of all the present main drains in their course to the river—say, for example, the catchpools to be about 1,000 yards or other convenient distance apart. The solid portion of the sewerage would settle down in these catchpools, the liquid portion passing on as the heavy portion settled

down in these wells, and as they filled the solid mass might be screwed up (in the night time) by enclosed Archimedian screws, the casings of which should be perforated with small holes to allow any liquid part to flow out. This manure would then be carted away to the railway station to be conveyed into the country in the empty return coal trucks left at the different depôts along the lines, and from thence conveyed away by farmers, who, from the example set by Mr. Mechi and the market gardeners near London, would, I imagine, be only too glad to get it. If they will not pay for it, then let them have it gratis or even pay them for removing it away, it would still be the least expensive manner for the inhabitants of London to get rid of what, as it is now accumulating in the centre of our town, is so great a nuisance, and leave the Thames once more a comparatively silver stream.

By the above plan there would be little or no inconvenience to the inhabitants in forming the catchpools, and certainly very little expense for vested interests; the river would be purer, more especially when its banks are made straighter and more uniform than at present, and other towns above London use the same means to save their sewage.

Trusting the above simple suggestions may be worthy a place in your journal,

I am, Gentlemen, yours, &c.,

A. McG.

Mary-terrace, High-street,
Camden-town, N.W.,
Aug. 12th, 1858.

THE SURVEY OF CHERBOURG.—Two or three years ago you might have met at one of the hotels of Cherbourg an English gentleman who seemed one of the idlest of mortals, and at the same time one of the most eccentric in his tastes. It was difficult to understand why a man who really seemed to have nothing to do, whose time was passed in strolling in *cafés* and in lounging, should have selected so dull a place as Cherbourg for the very protracted stay he made. No professional object could, it would seem, have taken him there, for no one ever saw anything in his hands but a walking-stick; and, although it is true that he did occasionally smoke a cigar now on this bastion and now on that ravelin, no one ever saw him take the trouble to make anything like a tour of the *enceinte*, and among the visitors to the port none were so incurious as to the works going on. And yet all the time that man was making a plan of the works. His harmless-looking walking-stick was a yard measure. As he trailed it listlessly up and down it was doing its work. A pocket instrument measured every angle when no one's eye was upon him. And thus, by visiting in succession during many months every portion of the fortifications, and combining his notes, our countryman had at last the satisfaction of placing in the hands of the military authorities that complete and accurate survey of the fortifications of Cherbourg which they now possess. So impossible is it to keep anything secret when men of energy, skill, and patience are determined to find it out.—*Manchester Examiner.*

STRENGTHENED CANNON AND ORDNANCE COMMITTEES.

GENTLEMEN,—I regret to find, by the War-Office and Woolwich Select Committee letters, lately published in your valuable Magazine, that no change for the better has taken place in the Ordnance Branch of the public department within my recollection, and that but little hope presents itself calculated to inspire inventors for the Government with that degree of confidence which the country has a right to expect. Captain T. Blakely's appeal to the justice of his "*brother officers*" amounts to nothing—it is not in the right road, however the strengthening of cannon by hooping them at the breech may be.

By those letters and statements, it appears Captain Blakely, an experienced Artillery officer, considered in the year 1855 the hooping of cannon desirable, as *it has since proved.* It also appears by your correspondent's letters, published by you, that Mr. J. P. Drake, N.M., C.E., also considered hooping the breech of cannon desirable, and that he recommended it twenty years since for restoring to the service the use of the re-bored guns, rendered otherwise useless by enlarging the calibre *beyond the strength of the metal;* and it further appears that experienced tester of the strength of wrought iron, Mr. Thomas Howard, C.E., of the King and Queen Iron Works, Rotherhithe, some ten years since proposed the hooping of mortars for the same object. And numerous other experienced gentlemen in France advocated the same principle, it would appear by the statement of the Select Committee, who, after the lapse of so many years, are induced to sanction experiments which, if made rightly, will prove of great value to the public service.

For those who have neglected their duty by not trying the validity of the invention before, there is no way by which they can be made responsible for that neglect; but surely it will never be permitted for the Committee to claim the right of adopting the invention in the service, without considering those who discovered and recommended the improvement.

This rule has been too long tolerated, and Her Majesty's service injured extensively by the placing of inventions on the shelf till convenient opportunities present themselves for bringing them into use *as a presumed right.* I trust Major-General Peel, as Secretary at War, and Major-General Carter, Director-General of Artillery and President of the Select Committee at Woolwich, have no intention of being guided by the acts of their prede-

cessors, as to attempt to repeat this unjustifiable rule.

By all means, now they have the power of testing the value of hooping the breech of cannon in the new works at Woolwich, let them do so, and not forget what is due to those whose judgment and experience induced them to recommend it.

I am, Gentlemen, yours, &c.,

OBSERVER.

August 16, 1858.

STRENGTHENING OF IRON ORDNANCE.

GENTLEMEN,—As a contribution to the history of strengthening tubes against internal pressure which appeared in your last Number, allow me to refer to the receiver of the hydraulic press that once formed part of the effects of the Adelaide Gallery for the illustration of practical science. In the experiments conducted with it, it would sustain a pressure of 30,000 lbs. on the inch, and was constructed by the late Mr. Perkins on the principle of shrinking on wrought-iron rings, end to end, upon an inner tube of cast iron. This, I believe, was the first public exhibition of the mode of gaining strength by the application of an exterior strain, but whether before or after Professor Barlow's mathematical investigations on the subject, I have not the means at hand to determine; and yet it would be interesting to know whether theory suggested the practice, or practice the theory. I am inclined to think the latter. At all events my own practice, which preceded what was done either by Mr. Perkins or Mr. Barlow, was founded on the obvious practical conclusion, that an extraneous compressing force, acting externally, could not but come in aid of the inherent force of any material to resist an internal disruptive strain. Accordingly, in the course of my experiments on the condensation of carbonic acid gas into a liquid by pressure mechanically applied, having been much annoyed by the breaking of glass tubes, I strengthened them by narrow steel rings, at intervals of three-quarters of an inch apart, and thus succeeded in making a tube withstand a pressure of 100 atmospheres. These rings were not shrunk, but driven on, upon a taper tube; and the tension was measuredly applied by a circular weight, with a hole in its centre for the tube to pass through, being allowed to drop upon the ring from a given height, until no further progress was made. [I send a tube so treated for your inspection.]

Here I have the pleasure of agreeing with Captain Blakely as to the value which ought to be accorded to a measured mode of adjusting the tension of rings or hoops. It is a very small matter in the way of invention to adopt a mechanical method of fixing them instead of by heat; nor is the ingenuity of the idea of transferring either expedient from hydraulic presses to pieces of ordnance so brilliant as to need discussion about its originality, but there *is* evinced on the part of Captain Blakely much judgment and practical acumen, in apprehending the full importance of the former mode of proceeding, inasmuch as nothing less than entire success or total failure would depend upon it. I can illustrate this by the case of the glass tubes; for, if the tension of a ring was too great, it would nip a tube in two. On the other hand, if applied at hap-hazard by means of heat to the more resisting material in a tube of cast iron, it might itself be so strained as to be useless.

It is a pity that the Ordnance Select Committee did not seize the particular point where lay the merit of Captain Blakely, namely, in a far-seeing appreciation of the vital importance of a certain mode of going to work, but where cursory observers would see only a trivial matter of mere detail, with even a retrograde aspect in the way of invention. Practical success often depends upon a refined perception of what is latent in apparently mean and minute particulars, but a man will seldom acquire credit by detecting it. At the same time I must be permitted to observe, that his improved method of strengthening pieces of ordnance, although successfully tested as it has been by experiment, is nevertheless altogether empirical—which, by the bye, is saying nothing against it—and has not for its foundation that mathematical theory and investigation on which he desires to rest it, and wherewith impart to it a certain prestige. To think that it has such a basis, is in my opinion a complete fallacy, and yet no doubt Professor Barlow is right within due limits; but this apparently paradoxical notion I fear you cannot afford me room to explain. It is only another instance, I apprehend, showing how the pure scientist is prone to make unreflective, indiscriminative, and unqualified applications to things of indubitable, but abstract and hypothetical, truth.

BENJAMIN CHEVERTON.

AWARD OF THE PLOUGHING PRIZE OF £500.—The judges, Messrs. Clarke, Druce, Shackel, and Wilson, have presented their report. It is beyond question, they say, that Mr. Fowler's machine is able to turn over the soil in an efficient manner at a saving, as compared with horse labour, of, on light land, 2½ to 25 per cent.; on heavy land, 25 to 30 per cent.; and in trenching, 80 to 85 per cent.; while the soil in all cases is left in a far more desirable condition, and better adapted for all the purposes of husbandry. They are, therefore, unanimously of opinion that he is fully entitled to the prize of £500.

CLEANSING THE FIBRES OF PLANTS.

Gentlemen,—After flax, hemp, or any other plant is cut, instead of laying it on the ground, I would propose laying it on stones cut across the grain (thereby exposing the laminous property of the stone), and letting the plant get dried by means of natural or artificial heat. At present the cleansing of the fibre of either flax or hemp is difficult, on account of the length of time it remains on the ground—the under side remaining green till turned over to the sun. If fibres were bleached at once, they would be much finer, and many important results would accrue. If linen could be made fine at once in the thread, it would become a strong rival to silk for aerial purposes—which, with the progress of man, are destined to play a powerful and beneficial part.

I am, Gentlemen, yours, &c.,

C. M. Dick.

School of Chemistry,
10, Dufour-place, Golden-square.

GROSS PLAGIARISMS.

Gentlemen,—Some little time back, you called the attention of your readers to the unparalleled impudence of the editor of a monthly contemporary, in appropriating the "labours of love" of the late Lady Bentham, in saying that the list of Sir Samuel Bentham's inventions was compiled by him. In this month's number he expands with indignation because some of the weekly newspapers have recommended the employment of the *Great Eastern* or *Leviathan* steamship in laying the Atlantic cable—an idea the exclusive merit and originality of which he claims for the author of some notices of that steamship which appeared in his journal, and which, as the "proprietor paid for" them, constitutes all suggestions to the same effect that appear thereafter in other publications, by writers who possibly or probably never heard of the journal in question, "*gross plagiarisms.*"

The next article in the journal is a continuation of a series on hemp and flax spinning machinery, illustrated by lithographs, which appear like old friends with new faces, and *the* descriptions have such a familiar sound that one almost thinks one has read them some sixteen or seventeen years ago, in the printed transactions of an extremely clever body of men. Do I dream, or has another "*gross plagiarism*" or "*wholesale appropriation*" been perpetrated?

Yours, &c.,

Magnum Bone 'em.

GAUNTLETT'S PATENT PYROMETER.

Gentlemen,—I perceive that a Mr. Gauntlett has patented and received a silver medal for an instrument exhibited at the last meeting of the Royal Agricultural Society. The novelty of the instrument is said to consist in the employment of metallic tubes in place of mercury, and in their connection with a clock movement, which puts in motion a drum to which a strip of paper is attached.

Upon reading this I, of course, saw at once that the instrument is precisely similar to that I proposed in No. 1789 of the *Mechanics' Magazine*, under the title of "An improved sun gauge," seeing which, I strongly suspect that Mr. Gauntlett's patent is invalid. I do not mean to assert that I was the first to propose the above arrangement, but I must say that I am unaware of an anticipator. At all events, we have here another example of the indiscriminate granting of patents.

I am, Gentlemen, yours, &c.,

J. A. Davies.

August 7, 1858.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

Goble, G. *A new or improved service-box for water-closets.* Dated Jan. 1, 1858. (No. 4.)

The action of this apparatus is as follows:—Pressure upon the seat of the water-closet is made to raise a rod which presses against a flexible part of the bottom of the service-box. A weight in the service-box is thereby raised, the valve in the supply pipe opened, and the valve of the water-closet pipe closed. The service-box is nearly filled with water, when a float rises and prevents the further escape of air. The further flow of water into the service-box is thereby stopped. When the pressure is removed from the water-closet, the weight in the service-box falls, opening the bottom valve and closing the valve in the supply pipe. The contents of the service-box then flow into the pan of the water-closet. The float is so connected with the valve in the supply pipe that when the valve is pulled down by the weight the float is pulled down with it, and the air valve opened. The improved service-box may be used either with or without a cistern.

Clark, J. W. *Improvements in steam engines and boilers, part of which improvements is applicable to furnaces.* Dated Jan. 1, 1858. (No. 8.)

This cannot be described without engravings. The patentee claims, 1. Arrangements for causing the pistons fitted in pairs in open-ended cylinders to work with equal pressure, and transmit concerted, steady, and uniform motion, by connecting them to cranks at equal angles on shafts at each end of the cylinders, tied by outside rods or links, and carrying driving wheels in the case of locomotives, or tied by links or other appliances to and driving a shaft, for transmitting motion in cases where only one driving shaft is required, all as described. 2. An arrangement of parts for admitting steam and exhausting, consisting of a block with curved passage opening and closing communication (from the steam-pipe exhaust and one or a pair of cylinders) in a fixed block, on the surface of which it slides. 3. The combination of a furnace flue pear-shaped in transverse section, extending nearly from

end to end of the boiler, and divided transversely by partitions perforated about the centre with flues, for the hot gases carried from the end of the furnace flue on each side thereof to the fire-box end of the boiler, and back to the chimney end. 4. The adaptation to furnaces, in combination with the aforesaid exhauster, of partitions dividing the smoke way or fire way transversely, and having perforations about the centre in the manner and for the purposes specified.

JOHNSON, J. H. *Improvements in penholders, pencil-cases, and other articles sliding in cases of a like nature.* (A communication.) Dated Jan. 1, 1858. (No. 7.)

This consists in applying to penholders, pencil-cases, &c., a spring which forces back the pencil or part containing the leads in ever-pointed pencils, tooth-picks, &c., into the interior of the pencil-case or tube when it is no longer required to be used.

HARVEY, R. *Improvements in steam hammers.* Dated Jan. 2, 1858. (No. 8.)

These relate to two or more piston rods and cylinders in connexion with, and for operating the hammer head. The cylinders may form part of the main framing, or otherwise, and are bored truly for the pistons. The rods pass upwards to a cross head, &c., from which descends a rod or rods to the hammer head. The steam may be admitted only to the under side of the pistons, and for lifting the hammer head: or the cylinders may have covers on their upper ends, and steam be admitted there to increase the pressure exerted by the fall of the hammer. By this adaptation of parts, the whole lower surface of the piston is acted upon by the steam when steam is admitted thereto.

SLATE, A. *Improvements in apparatus for supplying fuel to blast furnaces.* Dated Jan. 2, 1858. (No. 9.)

Here the fuel is crushed, and introduced by blast at the tuyeres, by apparatus capable of measuring the quantities delivered into the blast pipes. The pulverised fuel is placed in hoppers closed at the top, from the lower end of each of which is a descending pipe, which is connected with a blast pipe. Intermediate of the length of such descending pipe are slides or valves, which act in succession by a cam, &c., put in motion by the blowing engine, so that one is open when the other is closed, and so that the supply will be alternately cut off and admitted to the blast pipe, by which means the quantities supplied may be adjusted to the requirement.

WALTON, F. *Improvements in the manufacture of sheets or plates made of plastic compositions and other materials, and in the application thereof, either alone or in combination with other substances, to the manufacture of knife handles, mouldings, artificial veneers, floor cloths, and other ornamental and useful purposes.* Dated Jan. 4, 1858. (No. 12.)

This relates to two previous patents of the patentee, dated 20th Jan., 1857, and 30th April, 1857. The composition (the manufacture of which is described in the first patent above referred to) is spread upon plates of glass or metal, and by a suitable press is moulded into sheets, and afterwards cut into the desired form.

ELLIS, J. and J. H. *Improvements in machinery for subdividing or reducing into small particles masses of rock and minerals.* Dated Jan. 5, 1858. (No. 14.)

The principal machine represented by the patentee cannot be described without engravings. One of his simpler machines would be thus constructed:—A single roller, corrugated in its periphery, may be arranged to travel upon a bed plate, which may also be corrugated or perforated. The slabs of stone would be crushed by its passage between them into blocks, the size of which would be governed by the size of the indents upon the roller and plate. Or a single pair of corrugated or toothed rolls may be employed. The formation of the rolls by building them up of a series of discs forms part of the invention. The denticulated rolls are formed by turning each alternate disc a few degrees upon the spindle, instead of keeping the corrugations in one parallel line with their axes. Thus a tooth upon one disc would be presented to a hollow in the adjoining one. The rolls may also be grooved or corrugated round their peripheries, in a line transverse to their axes.

LEEMING, J., and J. C. RAMSDEN. *Improvements in looms for weaving.* Dated Jan. 5, 1858. (No. 16.)

These relate, 1. To the adaptation of a scroll plate for governing the different changes in the working of healds or needles, to produce different styles of weaving, or different crossings in the warp alternately in the same piece, such as twill and plain, sateen and plain, gauze and plain, and a variety of other styles. 2. To the adaptation of a scroll plate for governing the picking motion in power looms, when it is required to pick twice and once from each side alternately, or in some definite order, when the picking tappets or picking noses may either be slided on the picking shaft, so as alternately to be moved in or out of contact with their respective picking cones, or the picking cones may be alternately moved out of contact with their respective picking tappets or picking noses. The scroll plate and lever in this case are precisely the same as in the first part. 3. To a method of propelling the shuttle through the shed, or across the lathe, by india-rubber springs. 4. To a method of actuating shuttle boxes. This part refers to a patent granted to J. C. Ramsden, dated 1st of Dec., 1856, No. 2844.

PLATT, J. *Improvements in machinery or apparatus for spinning and doubling or twining cotton and other fibrous materials.* Dated Jan. 5, 1858. (No. 17.)

This relates to a method of driving the tin drum of the mule, and consists in adapting thereto a force exerted in opposite directions, so that the drum becomes as it were suspended; and to accomplish this the patentee arranges the driving band or bands on the drum so that it or they will pass on either side thereof, a distribution of guide pulleys being provided for the purpose. It also consists in the adaptation of the apparatus termed in mules the quadrant, for regulating the winding on to the turning jenny, and in the said machine he causes the chain, which proceeds from the slide, to pass over a pulley, connected to the nut of the regulating screw, and from thence to the drum.

DERING, G. E. *Improvements in electric telegraphs and in the manufacture of insulated wire and cables.* Dated Jan. 5, 1858. (No. 18.)

This consists, 1. In the employment at the transmitting and receiving stations of synchronous pendulums or balance-wheels, which at the transmitting stations are caused, by finger-keys or otherwise, to complete, or break, or modify an electric circuit; this effect, being produced at pleasure at the receiving station, has in connexion with it arrangements which record a letter or other symbol upon the electric influence reaching it from the distant station, but a different symbol according to the period of its oscillation at which the effect occurs, and thus a variety of signals may be produced. The manner of carrying out these principles may be greatly varied. The next part of the invention consists in a new telegraph instrument for indicating to the eye, or printing letters or other characters or symbols. It belongs to the class known as step-by-step instruments, but differs from others of its class in some important particulars. The next part consists in employing, in combination with the above or other recording telegraphs, means for obtaining simultaneously at the same receiving station two or more copies of the message, by the use of a corresponding number of recording instruments acting in concert with each other, and worked by the same local battery power, or by multiplying in the same instrument such portions thereof as will afford the additional

copies. The next consists in certain methods of lessening the difficulties experienced in telegraphing through long lengths of submarine or subterranean wires. The improvements in insulating wire consist in certain means of preventing the separation which usually exists between the wire and covering of gutta percha or other insulating material, and which separation is highly detrimental to the insulation by allowing moisture to spread by capillary attraction into contact with a considerable amount of surface of the conductor wherever any defect exists in the insulating covering. For this purpose, previously to the application of the main body of insulating matter, 1, he applies to the wire one coating or more of shellac or other suitable varnish or paint, in some cases allowing drying time, and in others not; or, 2, he applies to the wire a suitable solvent of the insulating matter to be used; or, 3, he heats the wire, in some cases previously varnished, employing any suitable heating apparatus, so as to cause the insulating matter to adhere. His improvements consist, lastly, in the following new constructions of telegraph cable for submarine use:—1st. In the combination in one and the same cable of two or more separate conductors for messages, such conductors affording, at the same time, the cable's chief resisting strength. 2nd. Both iron and steel wire are employed in the structure of the same cable, in combination with any other suitable materials, either or both being used as insulated conductors, or in forming the external covering, or in any other capacity.

JENNINGS, H. C. *Improvements in the production and application of tannin or tannic acid.* Dated Jan. 6, 1858. (No. 21.)

This consists in the production of tannin or tannic acid from bog peat, and the application thereof to tanning purposes.

MALCOLM, J. D. *Improvements in apparatus for ornamenting fabrics and other surfaces.* Dated Jan. 6, 1858. (No. 22.)

This consists of dividing the surfaces of fabrics by partitions into cells, and then filling in with flock, ground cork, or other like substances upon an adhesive ground.

LAVATER, M. L. J. *The application of the principle of exhausting air as used in plate-holders, breast pumps for pegs.* Dated Jan. 7, 1858. (No. 23.)

Here an india-rubber disc (as used in plate-holders) is fixed on the top of a wooden cup, and on the top of the cup is a rotary cylinder, the inside of which is a furnace screw or knob. The cylinder and cup are traversed through the centre by a square stem, the end of which is a screw working in the knot of the cylinder. To the other end of the stem is a flat button, which is fastened to the disc. The disc is placed on any solid surface, when by turning the cylinder it acts on the stem, which draws the india-rubber disc and creates a vacuum, which when done, the utensil will remain secure. For disadhering the said utensil unscrew the cylinder till the disc is forced flat.

CAPPON, F. P. *Self-acting pads for doors, shutters, windows, or other similar shuttings.* Dated Jan. 7, 1858. (No. 26.)

These pads are affixed to the doors, &c., so as to answer the same purpose as ordinary sand bags.

REILLY, J., jun. *Improvements in chairs and seats of various descriptions.* Dated Jan. 7, 1858. (No. 27.)

This consists in giving elasticity to the seats of chairs and other articles by means of cylinders containing pistons resting upon springs. By placing the cylinders on balls or universal joints, any kind of oscillating motion will be permitted.

PHILP, R. and J. *An improvement in propellers for propelling ships, boats, and other vessels in water.* Dated Jan. 7, 1858. (No. 29.)

This relates to screw propellers, and consists in fixing the blades in such positions upon the boss that, let there be two, three, or more, each blade shall constantly work in fresh in contradistinction to dead or churned water. The outer extremities of all the blades, whether there be two, three, or four, lie in the same plane. When there are two or four blades the patentees place the opposite blades in such position upon the boss that supposing a line were drawn along one side of each opposite blade it would pass through the centre of the boss, while lines drawn along the remaining sides would not pass through or near the centre of the boss. The invention cannot be described in full without engravings.

MAW, E. *Improvements in the construction of metallic bedsteads and other surfaces to sit or recline on.* Dated Jan. 7, 1858. (No. 30.)

Each metal lath has a slot at one end, and a fixed or loose stud carrying a fastener at the other end. On the rail where the fastener comes is a curved incline, and a slot to receive the fastener. A stretch is given to the lath by turning the fastener in the slot. In some cases the seat is supported by angle irons in place of flat laths, such angle irons carrying bent springs on which the seat rests, and which are free to move on their points of bearings.

LEES, S. *Improvements in the manufacture of mineral oil.* Dated Jan. 8, 1858. (No. 32.)

This consists in abstracting the oil contained in coal, cannel, schists, &c., by combining those substances with asphaltum or pitch, such asphaltum being the residue obtained in the distillation of tar produced in the manufacture of gas for illumination, and by the application of heat, which dissolves the asphaltum or pitch, and causes the mineral bituminous substances to dissolve and give off their oil; this oil then combines with the dissolved asphaltum or pitch, and is separated therefrom in the form of vapour by the continued application of heat, which may be used at a high temperature.

SOAMES, P., and J. C. EVANS. *Improvements in steam cranes, parts of which improvements are applicable to the generation of steam.* Dated Jan. 8, 1858. (No. 34.)

This relates to that class of steam cranes wherein the winding drum is driven by toothed or friction gearing, from a steam cylinder attached to the framing or platform of the crane, or to the boiler thereof, and consists partly in making the boiler which supplies the steam to the cylinder, and which may be carried on to the revolving platform of the crane, serve as the crane pillar or post. By these arrangements the ordinary pillar or post is dispensed with, and the size and weight of the crane are materially reduced. Any ordinary boiler may be used, but that preferred, and which is claimed as part of this invention, consists of a vertical shell fitted internally with one or more hollow conical water spaces, arranged one above another, with their apices upwards, and having one or more passages made through them to allow the heat and flame of the furnace to play freely over the upper and under sides of each water space. The chimney may be placed at the side of the boiler, and the fire bars are disposed beneath the bottom water space, which latter forms a hollow conical roof to the furnace.

BROOMAN, R. A. *A method of, and apparatus for, teaching music and arithmetic.* (A communication.) Dated Jan. 8, 1858. (No. 35.)

This musical, and, if required, arithmetical apparatus, or, as it is termed, "abcdaire," is intended to impart to children, to the blind, and to others, the first notions of music or of arithmetic. This result is obtained by the handling of moveable signs, capable of being fitted into or between lines or cases arranged for their reception. The apparatus may also be arranged to produce sounds corresponding to the different positions of the moveable signs.

ATKINS, H. *Producing scarfs, neck-ties, and other articles from the warp machine.* Dated Jan. 8, 1858. (No. 36.)

The patentee works the warp machine as heretofore for producing warp fabrics, but in making the

scarfs or neck-ties he so arranges the needles in the machine as to give any required length of the article, which, when made, he uses crosswise of the fabric as made in the machine, which gives both strength and durability to the articles, and at much less cost than when made upon the warp machine, in which case the width of the article corresponds to the width of the needles, whereas, by this invention, the length of the scarf corresponds with the width of the needles. The invention is also applicable for the production of ladies' trimmings for mantles and for covering ladies' bonnets, &c.

GREENWOOD, T., and J. BATLEY. *Improvements in machinery for heckling flax and other fibrous materials.* Dated Jan. 8, 1858. (No. 37.)

This relates to that class of sheet-heckling machines which have fixed heads, or in which a fixed trough is used to receive and support the flax holders in their traverse through the machine, the heckle sheets being caused to oscillate or move to and from the line of the pendant stricks, in order that the heckle pins may penetrate the flax gradually, and recede when the flax is required to be traversed forward to bring it under the action of the next gradation of heckles. Instead of mounting the heckle bars or heckles on hinged joints, and regulating their movements by crank levers for causing the heckle pins as the sheets are advanced to strike into the flax at or about a right angle to the pendant fibres, the patentees bolt or secure the heckles or heckle bars directly to the endless sheets, so that their head, or that part which carries the heckle pins, will be free to rise from the sheet when passing on to the top roller, and take up the required position for striking into the flax.

CHURCH, W. *Improvements in measuring rules, compasses, and other mathematical instruments, and in the machinery to be employed in manufacturing measuring rules and other mathematical instruments.* Dated Jan. 9, 1858. (No. 39.)

One of these improvements in measuring rules consists in making the joints which are employed for folding or doubling the sides of the rule of several plates of metal, equal in thickness to the thickness of the portions of wood with which they alternate. Another, in making the metal part of the principal joint of the rule of a different form from that ordinarily employed. The invention also consists in graduating the head of the screw which is used on one of the legs of the compasses, for facilitating the fine adjustment of the compasses. By graduating the head with uniform divisions, and attaching an index pointer to the fixed part of the leg, great nicety may be secured in setting off small distances by the compasses. The invention comprises other improvements which cannot be described without engravings.

ROWELL, T. *Improvements in furnaces.* Dated Jan. 9, 1858. (No. 40.)

Here the two sides of a furnace are constructed of hollow castings of iron, connected at front with a hollow dead plate, which has an opening below for the passage of air. These castings are connected transversely of the furnace by a hollow chamber within the bridge, and such chamber communicates with a transverse hollow casting beyond the bridge, which again communicates with air passages on either side of the furnace, and external to the hollow sides. At the front end of each passage is an opening into the furnace, which can be closed gradually by a door or valve; hence, when these doors or valves are open, air will enter from below into the front hollow dead plate, pass laterally into the hollow sides of the furnace, then into the chamber at their ends, thence into the hollow casting beyond the bridge, thence through the air passages into the front of the furnace, becoming heated before it enters. That it may be admitted for a time only after feeding the fire, and that the air so admitted may be gradually reduced after feeding, the doors or valves are arranged to be opened by opening the fire door, by suitable mechanism, and are not closed by the closing of the fire door, but the closing is regulated by air or other fluid passing through a small passage.

CHAUFOUR, J. A. M. *Certain improvements in the construction of axle boxes and axle bearings.* Dated Jan. 9, 1858. (No. 42.)

This system of constructing axle boxes and plummer blocks with cylinders for transforming in part a sliding friction to a rolling friction is composed, 1. Of a cast-iron axle box, in which is placed a shell or bearing of a cylindrical and octagonal form. This shell supports another shell which receives the cylinders. 2. Of two collars which support the journal at its two extremities, and form a basin or reservoir for the oil. 3. Of a vessel placed at the end of the shell for receiving the oil which escapes from the basin on one side only of railway axle boxes. 4. Of a feeding cup placed on the upper part of the axle box, for introducing the oil for lubricating the cylinders and journal. 5. Of a lower basin intended to indicate the level of the oil in the reservoir, and receive the waste oil. 6. Of a basin for receiving the oil which escapes from the back of the axle box. 7. Of iron or steel cylinders. 8. Of metal packing rings. 9. Rings or washers are employed in a single piece for journals which have no collars. 10. The dimensions of the friction collars are calculated according to the weight and speed.

KNOWLES, T., and W. OGILVIE. *Improvements in looms.* Dated Jan. 11, 1858. (No. 44.)

This relates, 1. To the shuttle-box motion, and consists in placing on the tappet shaft a pin wheel acting in the ordinary star wheel for giving motion to a pattern drum chain or belt. 2. To the shedding motion, and consists in connecting to the upper and lower jacks one end of cords or chains having their outer ends attached to pulleys, bell cranks, or segments connected to hooked rods, which can be raised by a pattern wheel or drum, so as not to give any motion to the jacks or healds, and thereby vary the pattern of the cloth.

TAYLOR, I. *Improvements in manufacturing metallic cylinders used in printing calico and other fabrics, and in imparting engravings to metallic cylinders used for such purposes.* Dated Jan. 11, 1858. (No. 45.)

This relates to a previous patent of the patentee, dated June 2, 1854, for forming metallic cylinders by bending plates of copper, &c., so that the two abutting edges of such cylinders, being suitably held together by solder or otherwise at their inner parts, shall be pressed together at their outer parts (where the edges of metal of the cylinder come together without the interposition of solder) by mechanic force applied at the outer surface, and consists, 1. In a method of applying force also to the interior of the shell. 2. In certain means of imparting an engraving to thin copper shells for printing calico and other fabrics.

BENTALL, E. H. *An improved arrangement of portable gearing apparatus for the application of horse power, principally for driving various kinds of agricultural machines or implements.* Dated Jan. 12, 1858. (No. 47.)

The object here is so to construct and arrange the parts of a gearing apparatus for the transmission of horse power that such apparatus may not only be portable, but that any unevenness of the ground will not in any way interfere with its efficient working.

BARLOW, C. *An improved registering water-meter.* (A communication.) Dated Jan. 13, 1858. (No. 51.)

This meter is composed of a small light turbine fitted in the middle of a closed chamber, through which the fluid has to run when flowing out. This turbine is rotated by the water as it runs, and its rotary motion is communicated to a magnet situate within the water chamber, which magnet actuates by its attractive power another one situated out-

side the chamber, which one gives motion to clock-work for registering as usual on dials the quantity of water, &c., that flows through it.

MUIR, G. W. *Improvements in warming and ventilating.* Dated Jan. 13, 1858. (No. 52.)

These relate, 1. To forming the pipes through which hot water is made to circulate with flanges. The pipes so formed are placed on the top of the fresh-air drain, and are thereby made to support tiles with which they are covered. The flanges and tiles have openings through which the air passes from the drain into the place to be warmed. 2. To constructing ventilators or ventilating shafts so that inward and outward currents are produced and maintained.

BROOMAN, R. A. *Improvements in the preparation of coal and other fuel.* (A communication.) Dated Jan. 13, 1858. (No. 53.)

This consists in preparing fuel for the prevention of smoke and the increasing of heat by combining it with one or other of the following substances, 1. Carbonate of manganese and sulphate of alumina, in the proportions of 2 parts of each to every 100 parts, by weight, of fuel. 2. Hydrochlorate of manganese, and carbonate of potassa or soda; 1½ parts of each to every 100 parts of fuel. 3. Bin-oxide of manganese and carbonate of soda; 2 parts of the former and 1½ of the latter to every 100 parts of fuel. 4. Nitrate of soda (calcined if desired) and oxide of iron; 1½ parts per cent. of the nitrate dissolved at 2 deg. of Baumé, and 2 per cent. of the oxide, the whole diluted in from 80 to 100 parts of water. The foregoing combinations are to be diluted with 80 or 100 parts of water, to render it capable of being mixed easily with the fuel.

BRIGHT, E. B. *Improvements in communicating signals by electricity, and in the apparatuses employed therein.* Dated Jan. 13, 1858. (No. 54.)

This consists in the use of a series of opposite currents of electricity, each producing a separate and complete signal. The effects of induction upon underground or submarine wires have made it necessary to employ one current to produce a deflection, and an opposite current to neutralise the first current and bring back the magnet to its place of rest. By this two currents are required for each signal, and the improvement forming the subject of the patent has for its object the removal of the delay caused thereby. The improvements embraced by the invention cannot be described without engravings.

PARSONS, W. *Improvements in apparatus for supplying water to, and for preventing explosions of, steam boilers.* Dated Jan. 13, 1858. (No. 56.)

The objects of this invention are effected by an arrangement of cylinders and pistons, valves, &c., in a manner which cannot be clearly described without engravings.

COUDER, J. B. A. *Improvements in shawls.* Dated Jan. 13, 1858. (No. 58.)

This is the only invention which has hitherto changed by means of the design or pattern as many as sixteen times the appearance of one and the same shawl. It is applicable to shawls with woven figures, to printed or embroidered shawls, as well as to shawls that are simply ornamented by the disposition of the chain and of the weft. The shawl presents two squares unlike each other, folded with the face sides outwards on the line, which has the appearance of separating the squares.

JEANROY, N. E. *Improvements in the manufacture of net lace.* Dated Jan. 14, 1858. (No. 59.)

The object here is to obtain, at lower cost, an increased variety of design and rapidity of production. The patentee replaces the bobbin-made flowers and designs by designs produced in the loom, which are afterwards cut out by hand. These flowers or designs are surrounded by a thread, and applied by the hand to tulle or net in the same manner as in the application of Brussels lace.

BROADLEY, J. *Improvements in apparatus used in weaving.* Dated Jan. 14, 1858. (No. 62.)

These relate, 1. To operating rotary shuttle boxes in order that any shuttle compartment of the series may be brought into a line with the race of the lay in effecting change of shuttle. 2. To giving motion to rotary shuttle boxes by an endless chain or band. 3. To a mode of using two or more shifting shuttle boxes. 4. To means for actuating heddles so as to obtain change in the character of the weaving being produced, as from plain to tweel, or tweel to satin, &c. These several features require drawings to illustrate them.

STENSON, J. *Improvements in the manufacture of wrought iron.* Dated Jan. 14, 1858. (No. 63.)

This consists, 1. In making forge bars with grooves, and forming therewith a box pile. 2. In the manufacture of "angle iron" from angular forge bars. It cannot be fully described without engravings.

INGLE, H. *Improvements in printing machines.* Dated Jan. 14, 1858. (No. 64.)

This invention was described and illustrated at page 73, No. 1824, vol. 69.

VARLEY, J. *Improvements in steam engines.* Dated Jan. 15, 1858. (No. 66.)

One of these improvements has for its object the working of steam expansively in the cylinders of steam engines, so that, when the engine varies in velocity, or a change takes place in the load upon the engine, the amount of expansion shall vary or remain constant as required. Another relates to a new compound valve, to be used for the double purpose of throttle valve and stop valve for steam engines. Another consists in fixing to the bottom of the ordinary air-pump piston a projecting hollow cylinder, with a bottom to contain the valves, the object being to bring out more water from the bottom of the air pump than the buckets now in use can accomplish, and consequently decreasing the height of water in the condenser, thereby allowing a greater amount of condensing surface to act upon the steam, the tendency being to produce a better vacuum in the cylinder.

SCHINZ, C. *An apparatus for manufacturing prussiate of potash.* Dated Jan. 15, 1858. (No. 67.)

This invention was described and illustrated at page 145 of our last Number.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

COCKER, T. F. *Improvements in the manufacture of wire, applicable to umbrellas and parasols, and to articles of dress.* Dated Jan. 6, 1858. (No. 19.)

This consists in applying to umbrellas and parasols, and to hoops and stiffeners for ladies' dresses, and to stays, flanged wire, that is to say, a form of wire which in the cross section has a flange or thin flat projection or spreading on each side.

BROOMAN, R. A. *An improved lock buckle.* (A communication.) Dated Jan. 6, 1858. (No. 20.)

This consists in forming a lock buckle by hinging to an ordinary lock bolt a tongue, the lock being attached to the buckle frame, and the front of the frame having a recess therein to receive the end of the tongue.

THIRY, C. A. *A new or improved oyster holder.* Dated Jan. 7, 1858. (No. 25.)

This is intended to hold each oyster separate, so that they may not be upset or dirtied by each other. It is composed of a series of circular supports, placed in stages on a central stem; these stages are made of wire, bent in form suitable to support all the shells, and it forms a dish suited for service on table.

GRAHAM, E. *An improved apparatus for threading needles.* Dated Jan. 7, 1858. (No. 28.)

This consists of a fine bar of steel, flat and per-

forated, fixed in a hinge, so that it can be raised or lowered at will. The hinge is fastened on to a flat piece of metal or wood, along which there is a groove having at one part a small indentation, from which point the surface is slightly lowered, but on one side of the groove only. The threader is made to fall into the groove with its point adjusted to the indentation. The groove is also perforated, so that a thread from a reel placed underneath or otherwise can be passed through both it and the threader. The eye of the needle to be threaded is then guided by means of the groove over the point, and down to the base of the threader, in its course passing over the thread which has been previously drawn through the threader and doubled. The short end of the thread being thus disengaged, the needle is repassed up the threader, over the single thread only, and the operation of threading is complete.

WINTON, G. J. DE. *Improvements in copying apparatus.* (A communication.) Dated Jan. 7, 1858. (No. 31.)

This consists of two or more rollers connected to one end of a system of "lazy-tong" levers, the other end of such levers having a strap secured thereto, which may be passed under the foot, or hooked on to a nail or hook, so as to cause the elongation of the levers (when held firm at the roller end thereof), and consequently bring the rollers close together, so that a book or case, containing the copying paper, &c., with letters, &c., to be copied, being placed between the rollers, and pulled through them, will copy whatever may be submitted to the operation.

RAYMOND, H. *Improvements in propelling ships or vessels.* Dated Jan. 8, 1858. (No. 33.)

This consists in placing within the hull of the vessel, in any suitable submerged position in the line of motion with the vessel, one or more cylinders provided with pistons or plungers, so as to admit of their being actuated by steam or other motive power, and a free ingress and egress of the water thereto obtained.

BROWN, R. *Improvements in water-closets, parts of which are applicable to pumps.* Dated Jan. 9, 1858. (No. 38.)

This relates chiefly to ships' water-closets, and consists in so forming the closet pan that the discharge orifice at the bottom thereof may be formed in an oblique or sideways direction.

PARSONS, W., and J. AITKEN. *An improvement in the measuring of water and other liquids, and an improved water and liquid meter.* Dated Jan. 9, 1858. (No. 41.)

This consists of a meter acting as follows:—The inlet into the meter is divided into parts, say four; one only leads to the measuring apparatus inside the meter case, while the remaining three lead through the meter without entering the measuring apparatus. The fourth, or other part, as the case may be, of the liquid enters a cistern inside the meter case, rises therein, and flows out at the top thereof into a compound tilting basin, gauged to hold a known quantity; as soon as this basin is full it tilts over, discharges its liquid, and, by an index connected with the shaft on which it rocks or tilts, indicates every such motion. The compound tilting basin is so constructed that during the brief period it is discharging its contents, and while returning to its position, the supply still running from the cistern inside the case already mentioned is received in a compartment thereof. The fourth part being known, the whole is of course known.

TREGASKIS, W. *Improvements in the printing press.* Dated Jan. 11, 1858. (No. 43.)

This consists in having the table or bed plate of the press firmly united to, and standing on legs or a frame, instead of sliding under the platten. One end of this bed plate is formed with guide grooves for rods to slide up and down in, which rods are united to the end of the platten by hinge joints. The opposite end of the bed plate has similar guide grooves to receive the ends of rods, having hooks or eye holes to take hold of the end of the platten. These two sets of rods are combined and acted on by levers and other mechanical means, so as to draw the platten down on the types to produce the required impression.

HARTREE, W. *Improvements in furnaces or fireplaces.* Dated Jan. 11, 1858. (No. 46.)

Here, an auxiliary furnace is constructed in front of the ordinary furnace. Over this auxiliary furnace is fixed a passage for the admission of the external air, which passage has a valve for regulating the quantity of air admitted. This valve may be worked by hand, or by self-acting means; between the auxiliary furnace and the ordinary furnace are arranged sets of fire bricks in the following manner:—There are sets of bricks placed vertically or across the flue communicating between the two furnaces; and beyond these bricks, and just over the ordinary furnace, are built up courses of bricks with oblique openings formed in them, the openings in one course being in one direction, and those in the next course being in another direction, so as to divide the streams of heated air, and set them in motion during their course through the openings of the bricks immediately before entering the ordinary furnace.

ROBERT, A. F. E. *Improvements in the manufacture of curtains and hangings for walls and other places.* Dated Jan. 12, 1858. (No. 48.)

This consists in the manufacture of curtains, &c., from thin sheets of caoutchouc. The inventor uses a pair of metallic plates, in which ornamental devices are engraved, and these plates he places one above and one below a case or frame, with a sheet of prepared caoutchouc between each plate and the case or frame. The whole is then set up together, by wedges and tie-frames, so as to enclose the air within the case or frame and between the plates. The whole is then placed in a furnace, and kept there until the air is sufficiently expanded to force the sheets of caoutchouc into the sunk devices of the plates. The whole is then removed from the furnace, and the sheets of caoutchouc, when cool, are found to be ornamented with the devices on the plates employed.

JOHNSON, J. H. *Improvements in boilers and heating apparatus generally.* (A communication.) Dated Jan. 12, 1858. (No. 49.)

The principal feature here consists in the use of a number of metal tubes or capsules closed at one end, whilst the other end is open, and communicates directly with the body of the boiler or main heating apparatus.

GREENWELL, G. C. *An improved pigment.* Dated Jan. 13, 1858. (No. 50.)

This consists of the use of that iron ore called pisolite in the manufacture of a pigment. The said ore is calcined and powdered in the ordinary manner.

ROBERTSON, P. *Improvements in inkstands.* (A communication.) Dated Jan. 13, 1858. (No. 55.)

Here, the ink vessel is made of vulcanised india rubber. Through the upper part of the vessel the hollow stem of a glass dipping cup descends, so that its lower end is pressed on the flexible elastic bottom of the vessel, which acts as an elastic valve to close the bottom of such hollow stem of the dipping cup, which gives way, and allows the ink to pass when pressure is applied to the ink vessel.

MATSON, C. E. *Improvements in roughing horses' shoes.* Dated Jan. 13, 1858. (No. 57.)

The roughing pieces consist of pieces of iron adapted to the shoe, having projecting pins or studs of iron or steel. For roughing the heels he introduces a strong cross bar, with forked ends, embracing each heel of the shoe. The roughing parts or studs are fixed in this cross bar immediately under the heels. The final specification of this invention was not duly filed, but a petition for an extension of time has been presented to the Lord Chancellor, and will probably be granted.

WOODCOCK, W., T. BLACKBURN, and J. SMALLEY. *Improvements in machinery or apparatus for heating and circulating air, to be applied to all purposes*

where heating is required. Dated Jan. 14, 1858. (No. 60.)

Here, the inventors employ air pipes heated by the hot air from the furnaces of boilers, &c., the air in the interior of the pipes being circulated over and over again by a fan or a piston in a cylinder placed in a frame, and connected to conducting pipes to and from the air pipes in the flues.

MANNING, J. H. *Improvements in the treatment of sewerage and other polluted liquids.* Dated Jan. 14, 1858. (No. 61.)

This relates to the use of the refuse still liquors obtained in the manufacture of chlorine for the preparation of bleaching powder, consisting of the chlorides of manganese and iron, and resulting from the action of muriatic acid upon manganese ores, in and for the deodorization and clarification of sewerage and other polluted liquids.

CLARK, W. *Certain improvements applicable to the paying out of submarine or submerged telegraph wires or cables.* (A communication.) Dated Jan. 14, 1858. (No. 65.)

This consists in attaching to the cable at intervals buoys that will not remain at the surface of the water, and hold the wire or cable suspended from them, but as they sink slowly with the cable will retard the descent thereof, and prevent, in a great degree, the tensional strain that would be due to the weight of the cable. It further consists in an indicator operated upon by the cable as it runs from the vessel, so as to indicate the degree of tension upon the cable.

MACINTOSH, J. *Improvements in apparatus for the manufacture of articles of confectionery.* Dated Jan. 15, 1858. (No. 68.)

This relates to the manufacture of "pan goods," the mechanical action necessary for the proper shaping of the articles in the pan or apparatus being produced by the mere rotation of the primary driving gearing. The action of this apparatus is, that, a carrying frame being caused to revolve, its revolution tends to cause the rotation of the pan; but the latter is restricted from rotary action by a lateral arm, which can work freely up and down a vertical groove. In this way, although the pan does not revolve, it receives a peculiarly powerful differential action, which rolls the articles in the pan to all sides in the most complete manner.

BOWLAS, D. *Improvements in machinery or apparatus for preparing and spinning cotton and other fibrous substances.* Dated Jan. 15, 1858. (No. 69.)

This relates to top rollers of spinning machinery, and consists in driving such rollers by endless bands passing around the neck of the top roller, and also around a driving shaft above or below the "roller beam," and by this means the inventor dispenses with the "saddle" weight, hooks, and weights in connexion with the top rollers, as by the use of the driving band any weight may be applied to the top rollers, and also any speed may be imparted thereto, the speed which he prefers being just to give the lead at the rate of about one in fifty quicker than the lower rollers.

PROVISIONAL PROTECTIONS.

Dated April 13, 1858.

794. G. A. H. Dean, of Ludgate-hill. An improvement in stereoscope's slides.

Dated July 14, 1858.

1590. J. Rheinauer, of Offenburg, Baden. Improvements in the bearings for axles and shafts in order to lubricate and exclude dust from such bearings. A communication.

Dated July 27, 1858.

1690. J. Scott, of Tain, Ross, N. B., gentleman. Improvements in pumps, which improvements are also applicable for the propulsion of ships, vessels, and boats.

1692. T. Line, of Birmingham. Improvements in engines for raising beer and other liquids.

1694. C. N. Kottula, of Liverpool, soap manufacturer. Improvements in the manufacture of soap.

Dated July 28, 1858.

1698. A. Bougault, of Decize, France, practical engineer. An improved apparatus for purging or clearing steam engines of their condensed water.

1700. R. Howarth, of Bolton-le-Moors, engineer. Improvements in furnaces for steam boilers for the purpose of consuming smoke and economising fuel.

1702. W. A. Gilbee, of South-st., Finsbury. Improvements in the preparation of hydrated oxide of chromium. A communication.

1704. J. Taylor, J. Lang, and J. Uttley, of Stalybridge, Chester. Improvements applicable to self-acting mules for spinning and doubling.

1706. J. Miles, of Risca, Monmouth, iron founder. Improvements in annealing pots used in the manufacture of iron, steel, and other metals.

1708. W. Buckingham, of Broad-st., Bloomsbury, rope manufacturer, C. Humfrey, of Camberwell, merchant, and L. R. Sykes, of Duke-st., Manchester-sq., gentleman. Improvements in the construction of telegraphic cables.

Dated July 29, 1858.

1710. G. Cavaggia and A. Spinelli, of Avignon, France, civil engineers. Improvements in obtaining and applying motive power.

1714. J. Brierley, of Kirkheaton, York, manufacturer. Improvements in machinery or apparatus for spinning wool and other fibres.

Dated July 30, 1858.

1716. J. F. W. Featherstonhaugh, of Surrey-sq., engineer, and F. Wise, of Peckham-grove, consulting engineer. An improved self-acting apparatus for admitting water to steam boilers and indicating the water level.

1718. J. Luis, of Welbeck-st. An apparatus for cooling beer and other liquids. A communication.

1720. G. W. Reynolds, of Birmingham, manufacturer. A new or improved cradle.

1722. J. Watkins, of Newport, Monmouth. Improvements in machinery or apparatus for the manufacture of tallow and other candles.

1724. H. Bessemer, of Queen-st.-place, New Cannon-st. Improvements in the treatment of pit coal and in the separation of foreign matters therefrom.

1726. J. Davey, mine agent, H. Sims, accountant, J. Mayne, mine agent, W. Hodge, smith, and J. Gerrans, miner, all of Gwennap, Cornwall. An improved construction of valve applicable to various descriptions of engines or machinery.

1728. N. S. Dodge, of St. Paul's-churchyard, merchant. Improvements in treating waste vulcanised india rubber. A communication.

Dated July 31, 1858.

1730. H. Douglas, Bart., of Green-st., Grosvenor-sq., general. Improvements in freeing screw propellers from wreck or gear with which they may become entangled.

1732. W. C. S. Percy, of Manchester, machinist. Improvements in arrangements and mechanism or apparatus for the manufacture of bricks, tiles, pipes, and other articles made of plastic earths.

1734. G. Davies, of Serle-st., Lincoln's-inn. Improvements in apparatus for planing electrotype and stereotype plates. A communication from R. Wheeler.

1736. H. Conybeare, of Abingdon-st., Westminster, civil engineer. Improved apparatus and machinery for the laying of submarine telegraph cables.

1738. G. T. Bousfield, of Loughborough-park, Brixton. Improvements in knitting machines. A communication.

Dated August 2, 1858.

1742. W. H. Crispin, of Stratford, copper smelter. Improvements in the construction of electric telegraph cables.

1744. J. W. Schlesinger, of South Lambeth, gentleman. A new or improved machine for roasting and basting articles of food. A communication.

1746. G. Davies, of Serle-st., Lincoln's-inn. Improvements in the manufacture of bituminous mastics. A communication.

1748. C. Mortimer, of South Carolina. Improvements in apparatus for raising and lowering ships' boats. A communication.

1750. J. L. Norton, of Belle Sauvage-yard, Ludgate-hill. Improvements in apparatus for drying wool and other substances.

1752. H. Greaves, of Westminster, civil engineer. Improvements in constructing streets, roads, and ways, thereby facilitating traffic, and providing for the more convenient conveyance of sewage, drainage, gas and water supplies, and telegraphic wires along the same.

Dated August 3, 1858.

1754. W. Taylor, of Kington, Hereford. An improvement in the manufacture of iron.

1756. T. Greenhalgh, of Bury, Lancaster, manufacturer. Improvements in apparatus applicable to steam boilers.

1758. R. Cunningham, of Paisley, card perforator. Improvements in the production of letter-press printing surfaces, and surfaces used in reproducing ornamental patterns or devices by printing or otherwise, and in the apparatus connected therewith.

1760. G. Bell, die maker, of Fore-st. Improvements in embossing and printing dies, and in the manufacture of "lace" or perforated embossed paper.

1762. J. H. Johnson, of Lincoln's-inn-fields. Improvements in inkstands. A communication.

1764. A. V. Newton, of Chancery-lane. Improved machinery for forging nails and other articles. A communication.

Dated August 4, 1858.

1766. C. Callebaut, merchant, of Paris. Improvements in sewing machines.

1768. J. Taylor, of Birkenhead, engineer. Pneumatic and hydraulic machines.

1770. J. W. Giles, of Sydney, New South Wales. An improvement in propelling vessels.

1772. W. Clay, of Liverpool, steel manufacturer. An improved manufacture of metallic hoops, bands, and other analogous articles.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," August* 17*th*, 1858.)

710. J. Fowler, jun. "Ploughing."
726. L. T. van Elven. "Raising and lowering weights."
732. C. H. Chadburn. "Pressure gauges."
736. B. Blanche. "Using Malacca and Manilla cane instead of whalebone."
740. E. P. Sibille. "Warming or cooling air," &c.
743. W. A. Gilbee. "Corking bottles." A communication.
745. W. Armitage and H. Lea. "Iron."
750. J. Doherty. "Buttons."
756. G. E. Taylor. "Raising pile."
757. G. Rowland. "Artificial whalebone."
763. W. Ager. "Rice cleaning."
764. R. McCafferty. "Preventing incrustations."
766. W. R. Jackson. "Railway break."
767. H. Bayley and J. Greaves. "Spinning and doubling."
771. R. M. Ordish. "Bridges."
772. A. Lees and D. Schofield. "Carriages for spinning machines."
778. F. A. Lecornu. "Drawing and levelling instruments."
783. A. Manbré. "Colouring spirits, beverages," &c.
784. J. Rae. "Iron ships."
787. S. Bickerton. "A thermo-pneumatic lubricator."
788. P. Michel. "Neck-tie and collar." A communication.
797. P. and F. Schäfer. "Fastenings."
813. A. V. Newton. "Pumps." A communication.
815. F. Preston and W. McGregor. "Files."
839. J. R. Chirm, jun. "Chimney-pot."
870. J. Adkins, and T. O. L. Buss. "Ships' compasses."
936. W. Keiler. "Cutting substances."
1004. M. Davis. "Carriage wheels."
1236. J. Luis. "Farming implement." A communication.
1523. J. Holland and F. Potts. "Ornamenting metallic surfaces."
1554. G. H. Wain. "Reefing sails."
1559. J. Loach and J. Cox. "Ornamenting glass."
1624. T. Greenwood, J. Batley, and J. Salt. "Preparing silk."
1634. T. Bailey. "Fire-arms."
1639. R. A. Brooman. "Apparatuses for receiving sewage." A communication.
1641. J. V. N. S. Petrziwalsky. "Bread."
1681. C. de Jongh. "Combing flax," &c.
1692. T. Line. "Beer engines."
1706. J. Miles. "Annealing pots."
1738. G. T. Bousfield. "Knitting machines." A communication.

The full Titles of the Patents in the above List can be ascertained by referring back to their numbers in the Lists of Provisional Protections previously published.

Opposition can be entered to the granting of a Patent to any of the parties in the above List who have given notice of their intention to proceed, within twenty-one days from the date of the Gazette in which the notice appears, by leaving at the Commissioners' office particulars in writing of the objection to the application.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

1800. V. Delperdange.
1809. A. Heaven.
1812. G. Durham and C. Wyatt.
1814. E. Finch.
1830. E. Topham.
1835. E. D. and G. Draper.
1838. A. and F. Thornton.
1841. G. Sanders and R. E. Donovan.
1848. S. Statham and W. Smith.
1850. A. V. Newton.
1854. F. May.
1861. C. Rowley.
1864. W. and F. B. Fawcett.
1867. W. E. Baker.
1871. G. Collier.
1874. W. Sangster.
1875. R. Crawford.
1877. A. Savage.

LIST OF SEALED PATENTS.

Sealed August 14*th*, 1858.

161. E. Hammond.
304. W. Riddle.
306. J. Piddington.
310. G. Claridge and R. S. Roper.
313. H. Blair.
314. F. Jones.
315. J. Beattie.
316. W. Riley.
323. J. E. Cook.

324. W. Skallitsky.
326. W. E. Nethersole.
330. H. Edwards.
333. F. M. Baudouin.
335. H. Rey-Rimels.
340. W. Betts.
344. W. Hall.
347. J. Potts.
348. F. Puls.
354. E. Toynbee.
355. G. F. White.
386. A. J. Dessales.
390. D., R., and G. Nurse.
481. G. Davies.
482. H. Dauphin.
487. G. Davies.
831. J. H. Johnson.
1042. W. C. Forster.
1076. J. Hamilton.
1109. S. Higgs, jun.
1168. P. Griffiths.
1249. A. V. Newton.
1261. T. and J. T. Crick.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions.

NOTICE TO CORRESPONDENTS.

Articles and Correspondence designed for insertion in the ensuing Numbers of the *Mechanics' Magazine* must reach the Office by the Tuesday of each week, at the latest. It is highly desirable that they should be forwarded earlier if possible.

CONTENTS OF THIS NUMBER.

LONDON: Printed and Published by Richard Archibald Brooman, of 166, Fleet-street, in the City of London. Sold by A. and W. Galignani, Rue Vivienne, Paris; Hodges and Smith, Dublin; W. C. Campbell and Co., Hamburgh.

Mechanics' Magazine.

No. 1829.] SATURDAY, AUGUST 28, 1858. [PRICE 3D.

Edited by R. A. Brooman and E. J. Reed, 166, Fleet-street, London, E.C.

CLARE'S PATENT STEAM ENGINES, BOILERS, &c,

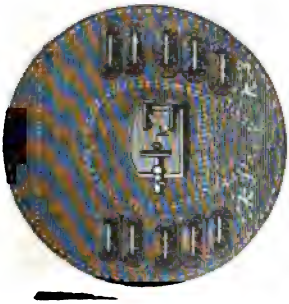


Fig. 4.

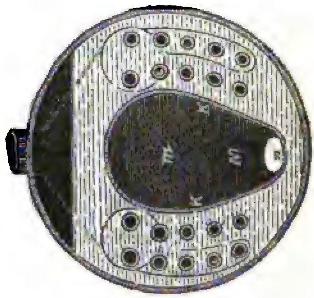


Fig. 5.

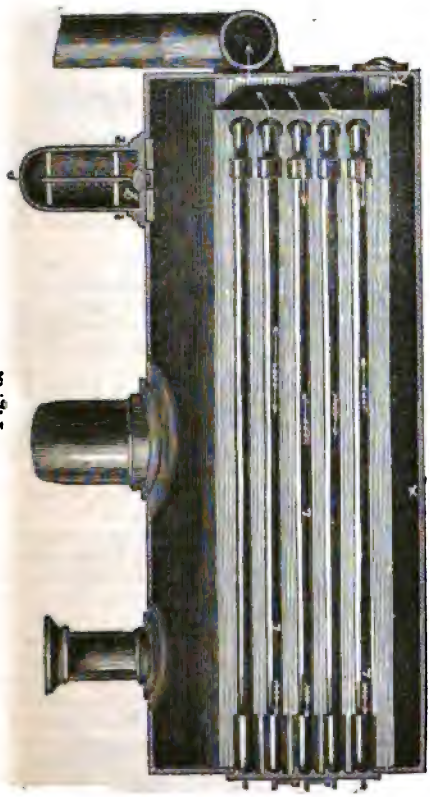


Fig. 3.

Fig. 6.

CLARE'S PATENT STEAM ENGINES, BOILERS, &c.

MR. J. W. CLARE, of Surrey-square, London, who has publicly interested himself considerably in the generation of steam and other engineering matters lately, has patented the following improvements in steam engines, boilers, &c. His specification, upon which we have to depend for our knowledge of his invention, appears to us to be drawn in a loose and wandering style, but we will do our best to extract the patentee's meaning from it.

The objects of this invention are principally the construction of an engine by which more work will be performed or higher speed obtained with steady action, and of a boiler in which cost of construction and fuel are reduced, and more complete combustion effected. This engine and boiler are especially adapted for being employed in combination for locomotives. The accompanying engravings explain the invention as applied to a locomotive.

Fig. 1 is a horizontal section of the working parts of this engine with cylinders in section. A, A^1, A^2 are three steam cylinders, placed side by side without ends or cylinder covers, each fitted with two pistons, B, B, having piston rods, *b*, *b*, connected by rods, *e*, *e*, to crank shafts, E, E, one at each end of the cylinders. The cylinders being open at both ends, no stuffing boxes are required, but the piston rods travel in mortice blocks, *f*, *f*. Steam is blown alternately into each cylinder between its pistons to drive them apart, the pistons receding in one cylinder tending to cause those in another to approach. The action of the steam is thus balanced and exerted equally. The patentee prefers in certain cases to use cylinders of smelted metal rolled round a mandril or core to the desired dimensions.

Although the engine is described as adapted for a locomotive, it may be applied as a stationary or marine engine, or for purposes where only one driving shaft is required, by connecting the ends of the shafts, E, by links or other gear or appliances to another or extra shaft, which drives the screw or paddles, or transmits motion to other apparatus, as the case may be. There are three cylinders shown, but a greater number may be used.

Fig. 2 is a sectional elevation of an arrangement for admitting and exhausting steam into and out of the cylinders. I is a fixed block containing three passages, i^1, i^2, i^3, of which i^1 communicates with a cylinder, i^2 with the steam pipe, and i^3 with the exhaust; J is a block caused to slide to and fro on the surface of the block, I, by excentrics, and contains a curved passage, j^1, the ends of which, as the block is shifted, are brought alternately over the mouths of the passages in the fixed block, I, and thus open and close communications with the steam pipe and cylinder and the cylinder and exhaust alternately; j^2 is a spring for keeping the block to its work.

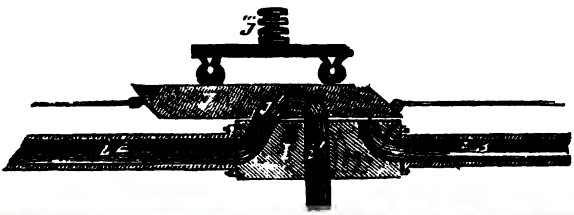
Or, these objects may be effected by a block with oblique orifices sliding to and fro between two blocks containing communications with the supply, the exhaust, and the cylinders, or by bringing the supply pipe (or the exhaust) into a fixed block, so as to lead into a passage in a revolving block brought alternately into and out of communication with a passage from the cylinder, a like arrangement may be adopted for carrying off the waters of condensation.

Fig. 3 is a longitudinal view of the boiler partly in section, fig. 4 an end view, fig. 5 a transverse section, and fig. 6 a horizontal section. K is the furnace flue of the boiler, pear-shaped in transverse section, as shown in fig. 5, and extending nearly from end to end of the boiler; L, L are flues for the hot gases for heating the water. These flues proceed from the further or chimney end of the furnace flue, pass along the boiler to the fire box end, parallel with and on each side of the furnace flue, and return the whole length before proceeding into the chimney. The flues, L, are shown as ten in number, but there may be more or less, as desired. At the furnace end the outer and inner portions of each flue are united by a U connecting pipe, having a neck fitting through the boiler end, and closed by a cap which may be unfixed to introduce an instrument for cleaning out both parts of the flue; doors are provided for cleaning the chambers; k^1 is a furnace door, k^2 is a door for cleaning out the ash-pit, k^3, k^3 are tubes for supplying the furnace with air; other passages with regulators may be formed through various parts for this purpose. The boiler is made so that the grain of the iron runs circumferentially or round the shell. Each end may consist of a plate having a flange fitting in and bolted to the end edges of the shell, or the shell may have flanges to receive the ends. The furnace flue and other flues are all immersed in water. M, M are partitions formed by preference of fire-brick, fitted in the furnace flue, K, in such manner as to extend right across it and from bottom to top, dividing it transversely. Perforations or openings are formed through the partitions at or about the centre thereof, through which the products of combustion are drawn, so that the partitions become quite hot near the

centre, though not so heated at the edges, and the denser products are thus consumed while the gases pass into the flues and heat the water. The same result may be obtained by placing in the furnace flue lumps of fire-brick or other incombustible material piled to the top and across between the sides. When more than one partition is employed, the front ones are cut away at *n*, to pass a tool for raking out the flues.

The patentee proposes to apply to furnaces generally this mode of consuming products of combustion, by fitting in the fireway or smokeway similar partitions extending right across the passage so as completely to divide it transversely, and having perforations or

Fig. 2.



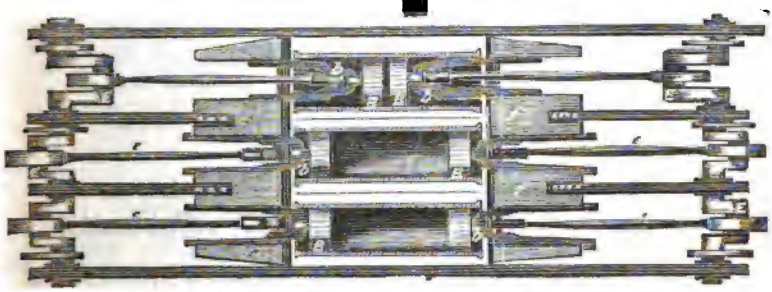


Fig. 1.

channels, *m*, about the centre, as described. P is a safety apparatus, employed in addition to the ordinary safety valve, consisting of a chamber or dome fixed to the top of the boiler, having within it a weight held in a guide frame or a cap, *q*, kept down by a spring, and resting on and covering the mouth of a pipe or orifice formed in the top of the boiler. This cap should be adjusted according to the maximum pressure desired, so that, if it be exceeded, the cap will be lifted and the steam blown away through orifices, *t*, *t*, thereby preventing the pressure within the boiler from exceeding the proper maximum; and the steam so blown off may sound alarm whistles at both orifices of different pitch to call the driver's attention.

HARBOURS OF REFUGE.

The study of Mr. Calver's book, noticed in our last two Numbers, induces us to bring to the notice of our readers the report of the Select Committee appointed "to inquire into the policy of making further grants of public money for the improvement and extension of Harbours of Refuge."

This Committee, who were originally appointed in the session of 1857, have continued their labours since their re-appointment at the commencement of the late session. They have not thought it necessary to take any evidence as to the great and increasing extent of the shipping interests which are involved in the inquiry entrusted to them, inasmuch as there is an abundance of documents already before the House which sufficiently illustrate those points, but to which it may not be out of place to refer as bearing upon the observations which the Committee have made. In the "Statistical Abstract" laid before Parliament in the present session, at pages 30 and 31, accounts are given of the progress of the shipping of the United Kingdom for a series of years. From these accounts it appears that in 1843, only fifteen years

ago, the entire amount of British shipping which entered into and cleared from the ports of the United Kingdom was 7,181,179 tons, and of foreign 2,643,383 tons, making together an aggregate tonnage of 9,824,562 tons; but that so rapidly has the shipping trade of the country increased in the interval, that in 1857 the quantity of British tonnage entered into and cleared from the ports of the United Kingdom had increased to 13,694,107 tons, and the foreign shipping to 9,484,685 tons, making an aggregate quantity of no less than 23,178,782 tons, being an increase of 13,394,230 tons, or of one hundred and thirty-six per cent. in fourteen years. Again, the same returns show, that, while in the year 1843 the tonnage of sailing and steam ships built and registered in the United Kingdom amounted only to 83,097 tons, in 1857 it had increased to 250,472 tons; and, lastly, it appears that, while the entire number of men (exclusive of masters) employed in the registered vessels of the United Kingdom in the home and foreign trade, not including river steamers, in 1849 was 152,611, that number had increased in 1857 to 176,387 persons. The progress in our shipping thus referred to, however great it may appear, has continued steadily from year to year, which would seem to indicate that it is destined to go on at about the same rate. The practical conclusion which the Committee derive from these considerations is, that, however much it may appear that harbours of refuge are now required for the security of our shipping, it is a want which must become more and more urgent from year to year. And moreover, that, inasmuch as the construction of such harbours must necessarily occupy many years, it is of the utmost importance that no time shall be lost, first, in determining upon some national policy in relation to them, and next, in giving practical effect thereto.

The number of ascertained casualties in the years 1852-6 amounted to 5,128, being an average of 1,025 a-year. These casualties consisted of—

1. Total losses by stranding or otherwise	1,940
2. Total losses by collisions . . .	244
3. Serious damage, having to discharge .	2,401
4. Collisions with serious damage . .	543
Total . . .	5,128

The total ascertained losses from all causes, therefore, amounted to 2,184 vessels, or at the average of nearly 437 in each year. The total reported loss of life connected with these casualties was 4,148 persons, or, upon an average of five years, nearly 830 in each year. In 1854 the loss of life amounted to no fewer than 1,549 persons. The value of the property lost by total wrecks is estimated by Captain Washington at £1,000,000 a-year at least, and by other losses and casualties at £500,000, making together £1,500,000 as the annual loss to the country from these casualties on our coasts. Captain Sulivan considers this a very low estimate, and would place it higher. It may, therefore, be fairly stated that under present circumstances the ascertained average loss upon the coasts of the United Kingdom amounts annually to 830 human lives, and property to the value of £1,500,000; and this is independent of the numerous and serious losses both of life and property connected with the fisheries on the coasts.

In conducting the inquiry referred to them, the Committee have endeavoured to keep strictly in view the distinction between harbours constructed and required for the trade of particular ports, and harbours of refuge applicable to the general trade of the country, foreign as well as coasting, frequenting or passing particular parts of the coast. It has been mainly to the latter, viz., harbours of refuge upon such parts of the coast as, being much frequented, are without any adequate place of safety into which vessels can run if overtaken by storms, that their attention has been directed. Already considerable portions of our coasts are furnished with natural harbours of refuge. Along the whole of the west and north coasts of Scotland, numerous and excellent natural harbours exist. For a portion of the east coast of Scotland, the Firth of Forth forms an excellent place of refuge. On the east coast of England, the Humber, the Wash, the Yarmouth Roads, and the Thames afford, in different degrees, places of security. Between the Thames and the Land's End, extensive harbours are being constructed at Dover and Portland, in compliance with the recommendation of the Royal Commissioners of 1837 and 1844; excellent harbours already exist at Plymouth and Falmouth, and good shelter is found on other parts of that coast. Between the Land's End and the Solway, some shelter is afforded in the Bristol Channel and in the natural harbours on the Welsh coast; a large harbour is also being constructed at Holyhead, which has already, even in its incomplete and unfinished state, proved of great advantage to the extensive trade of that part of the kingdom. The coast of Ireland is well furnished with natural harbours, though works to a comparatively limited extent are required in order to render some of them in the most important localities more available for national purposes.

The most dangerous portions of the coast where works of a national character are necessary and practicable are, first, that part of the east coast of Scotland extending from the Pentland Firth, on the north, to the Firth of Forth, on the south; second, that part of the east coast of England extending from the Fern Islands, on the north, to Flamborough Head, on the south; third, that portion of the west coast of England extending from the Land's End to the south coast of Wales, and including the Bristol Channel; fourth, the points on the coast of Ireland to which reference has already been made, and one point in the Isle of Man. Independent of the three great works now in progress at Holyhead, Portland, and Dover, these constitute the works which the Committee are of opinion are most urgently required.

FIRST.—THE EAST COAST OF SCOTLAND.

Between the Pentland Firth, on the north-east extremity of the coast of Scotland, and the Firth of Forth, on the south, there is no harbour for the shelter of vessels caught in storms except Cromarty Firth, and that is so deeply embedded in the bay as to be practically unavailable for the great bulk of the shipping passing that line of coast, which is generally of a very bold and dangerous character. The traffic on this coast is very considerable. Independent of the coasting trade, and that with the Orkney and Shetland Islands, there is a large trade with Archangel and other ports in the North of Europe, and there is also a large trade between the ports on the west coasts of England and Scotland, and Ireland, and the ports in the Baltic and the North of Europe, passing to and fro through the Pentland Firth. Besides all this passing trade, a very large trade has of late years risen up, and is still increasing, between the continental ports and the north-east coast of Scotland, in the export of fish. It appears in evidence that shipping resorts to the port of Wick alone to the extent of 60,000 tons a year for the export of fish. The want of a good harbour of refuge on this part of the coast has been very strongly urged upon the Committee by all the witnesses who have given evidence upon the subject, but principally by the experienced officers attached to the Admiralty. It has been urged mainly in respect to the trade of the coast, including the fisheries, but also, in some degree, for the use of the ships of Her Majesty's Navy. Three places have been pointed out as the best suited for the construction of such a harbour, viz., Wick, Peterhead, and Fraserburgh. The majority of evidence is, however, in favour of Wick, with reference especially to the fishing trade.

With regard to the formation of a harbour of refuge at Wick, it is necessary to state that the Commissioners for the present harbour in connexion with the Fishery Society, have it in contemplation to enlarge the present harbour, and are prepared to expend a sum of £45,000 thereon; the inadequacy, however, of the proposed plan and improvement for the objects required has been strongly pointed out by the officers of the Admiralty, and especially in the evidence of Captain Vetch, who produced a plan to the Committee by which the objections would be obviated, and sufficient accommodation secured for all the objects of the harbour, whether for the purposes of fishing, of trade, or of a naval station at a cost estimated by Mr. Coode, the officer in charge of the works at Portland, not to exceed £186,000. It is understood that the Fishery Society is ready to apply the sum at their command towards this large work, in place of expending it upon the smaller work contemplated. The harbour proposed by Mr. Stevenson at Peterhead would enclose a space of 200 acres at low water, and of 100 acres within the three-fathom line, and is estimated by him to cost £335,000. The plan proposed by Mr. Abernethy for the improvement of Fraserburgh he estimates would cost £80,000, and would furnish a sheltered area of 11 acres for vessels drawing 20 feet and upwards, and about 30 acres for vessels of a less class.

SECOND.—THE COAST FROM LAND'S END TO HARTLAND POINT, AND THE BRISTOL CHANNEL.

In considering this part of the coast, the Committee draw a distinction between the part extending from the Land's End to Hartland Point, and that further up, embracing the whole of the Bristol Channel on both sides. The evidence goes to show that the part of the coast up to Hartland Point is frequented chiefly by small coasting vessels. On the other hand, the Bristol Channel is frequented by foreign-going ships, rapidly increasing in number, and of large tonnage. With respect to the first of these two divisions, the two points most strongly recommended for the construction of a harbour of refuge within this district are St. Ives and Padstow. The points in the Bristol Channel to which attention has been chiefly drawn as offering the best security for the shipping frequenting it, are the Mumbles Head, Lundy Island, and Clovelly. Much difference of opinion has been expressed as to the respective merits of these places, and they will require a minute investigation. The Committee state upon this part of the subject, that, judging

by the state of things which has arisen in the crowded coal ports of the north of England, any place which is finally determined upon for affording refuge to ships frequenting the Bristol Channel should have special reference to the rapid development of the coal and iron fields in South Wales, and to the increasing sea traffic which is arising therefrom.

(To be continued.)

THE ATLANTIC TELEGRAPH.

The public manifestations of feeling in honour of the successful completion of this great enterprise are very general on both sides of the Atlantic. Her Majesty's telegraphic despatch as transmitted through the conductor of the Atlantic cable to his Excellency the President of the United States, and the reply of his Excellency thereto, as also received through the cable, are given below. The President's message, with address, numbered 143 words as transmitted, and occupied two hours in its passage through the cable, including several "repeats" and corrections. We also attach copy of a complimentary message from the directors of the New York, Newfoundland, and London Telegraph Company, in reply to the inaugurating message transmitted to them from the directors of the Atlantic Telegraph Company.

"*From Her Majesty the Queen of Great Britain to His Excellency the President of the United States.*

"The Queen desires to congratulate the President upon the successful completion of this great international work, in which the Queen has taken the greatest interest. The Queen is convinced that the President will join with her in fervently hoping that the electric cable, which now already connects Great Britain with the United States, will prove an additional link between the two nations, whose friendship is founded upon their common interest and reciprocal esteem. The Queen has much pleasure in thus directly communicating with the President, and in renewing to him her best wishes for the prosperity of the United States."

The following is the President's reply to the foregoing:—

"*The President of the United States to Her Majesty Victoria, Queen of Great Britain.*

"Washington City.

"The President cordially reciprocates the congratulations of Her Majesty the Queen on the success of the great international enterprise accomplished by the skill, science, and indomitable energy of the two countries. It is a triumph more glorious, because far more useful to mankind, than was ever won by a conqueror on the field of battle. May the Atlantic Telegraph, under the blessing of Heaven, prove to be a bond of perpetual peace and friendship between the kindred nations, and an instrument destined by Divine Providence to diffuse religion, civilization, liberty, and law throughout the world. In this view will not all the nations of Christendom spontaneously unite in the declaration that it shall be for ever neutral, and that its communications shall be held sacred in passing to the place of their destination even in the midst of hostilities?

"James Buchanan."

"*From Peter Cooper, President of the New York, Newfoundland, and London Telegraph Company, to the Directors of the Atlantic Telegraph Company, London.*

"New York, Aug. 18.

"The directors of the New York, Newfoundland, and London Telegraph Company desire to express to the directors of the Atlantic Telegraph Company their joy and gratitude for facilities and privileges of coming into closer union and fellowship with them and their fellow-men throughout the world. May the success that has crowned our labours secure to the nations of the earth a perpetual bond of peace and friendship."

The Lord Mayor of Dublin has invited Mr. C. T. Bright and his colleagues to a public entertainment in the city of Dublin, at which Lord Eglintoun, the Lord Lieutenant of Ireland, is to be present.

By the despatches received from America on Monday last, the Atlantic telegraph was, in the words of an enthusiastic journalist, "the one great question with the people and the press, north, south, east, and west." Massachusetts was boasting that Franklin, who first discovered the qualities of electricity, was born in that State. The same paper says, "The earth has witnessed nothing half as auspicious—nothing so full of glad tidings to mankind—since the birth of the Redeemer. If the 'morning stars sang together and all the sons of God shouted for joy' at the creation of the world, surely the eye of faith, without impiety, may reverently recognize in this union of the two mighty physical divisions of that creation a providential dispensation that may inspire even the angels of heaven with delight. It is well, therefore, that in many of the churches yesterday the 'telegraph' was in the pulpit, as elsewhere, the one idea—for the Church and Christianity are, in the end, to gather

in a rich harvest of its fruits. The golden chain of human brotherhood has had a strong bright link added to it, which, with God's blessing, will in due time bring all nations, all kindreds, all tongues, within its friendly and loving embrace. The Orient and the Occident clasp hands! The east and the west are one; and with the universal diffusion of universal intelligence good men may hopefully look forward to the dawn of the blessed millennium." The rejoicings at the success of the undertaking continued with undiminished excitement.

The Mayor of New York addressed a communication to the Common Council announcing that, in his opinion, it became the authorities of that city to adopt suitable measures for a public celebration of so important an event, and that he deemed it his duty to communicate with that body, as well for the purpose of making such recommendation, as to congratulate it, and through it the citizens of New York, "on the complete triumph which superior energy and perseverance have accomplished in uniting together, by the Atlantic Cable, not only our own city, but the whole of our country, with Europe, and the greater part of the civilized world." "Our city and country," continues he, "have a right to claim an ample share in the glory of this peaceful achievement. The genius of Franklin, the patriot and philosopher, lit the way to the brilliant succession of discoveries in electrical science, the most useful of which is undoubtedly the practical application of this noble element to telegraphic purposes by our countryman, Morse, thus enabling the actions, feelings, and sentiments of every people to be communicated to each other with almost the rapidity of thought. Besides, the majority of the active officers of the company by whose public spirit and noble enterprise the electric chain has been laid are our own citizens and countrymen. Their names are known, and, if we do not, posterity will surely reward them. While the noble ship, the *Niagara*, was generously tendered by our Government to aid in the important work, by the consummate skill and sleepless care of her commander and other officers, and the eminent and skilful gentlemen on board of her, the western part of the cable was laid."

The Lord Mayor's message being read, Alderman M'Spedon presented a preamble and resolutions, which were also read, to the effect "that the thanks of the Common Council are eminently due, and are hereby gratefully tendered, to our distinguished and universally esteemed fellow-citizen, Cyrus W. Field, Esq., and also to his associates of the New York, Newfoundland, and London Telegraph Company, and their numerous and valuable assistants, to whom we are indebted for the accomplishment of this wonderful and prodigious enterprise, connecting the Old and New Worlds, which was deemed by many impracticable and impossible, and which must lead to great and important results between the two nations, that are now incalculable, and which, it is believed, will prove a mutual advantage to the civilized world.

"That, in commemoration of this world-renowned achievement, the Common Council tender to the officers of the Telegraph Company, and such other gentlemen as were engaged in this inconceivably great enterprise, a municipal dinner at such time as may be to them convenient and acceptable.

"That, in further commemoration of this glorious success, the City Hall be illuminated, and that suitable fireworks for the occasion be procured, to give additional expression to the general rejoicing of our entire community.

"That, as we owe the result of this heroic event principally to our own fellow-citizen, Cyrus W. Field, Esq. (whose master mind, energy, and perseverance amid doubt and disaster finally triumphed), he be requested to sit for his portrait, to be placed in the Governor's room in the City Hall.

"That a committee be appointed to carry out the foregoing resolutions, and that the sum of 10,000 dols. be and is hereby appropriated to carry the same into effect.

"That the clerk of the Common Council cause copies of the above proceedings to be appropriately engrossed and furnished to each of the officers connected with the expedition."

All these unaffected demonstrations of pleasure, and all these efforts to honour the promoters of the Atlantic Telegraph undertaking, are very natural, very proper, and, withal, very much superior to the usual manifestations of public excitement, inasmuch as they spring from a great and peaceful triumph of science, and not from any doubtful occasion of popular interest. It is an exceedingly pleasant fact that the first piece of intelligence ever transmitted through the Atlantic Cable was of a nature to spread a sense of joy and gratitude throughout both the English and the American nations. On Saturday last, the morning papers published the following despatch:—

"The Directors of the Atlantic Telegraph Company, having received from Newfoundland the following intelligence, have felt it their duty to publish it, with a view to allay the anxiety of the friends of

the passengers by the *Europa* and *Arabia*. Further particulars have been asked for, and will be published, if received:—

"'The *Europa* and *Arabia* have had a collision.

"'One of them has put into St. John's, Newfoundland.

"'No lives lost. All well.'

"FURTHER PARTICULARS.

"'The *Arabia* in collision with the *Europa* off Cape Race on Saturday last.

"'The *Arabia* on her way to New York slightly injured.

"'The *Europa* lost her bowsprit and cutwater, stern sprung.

"'She will remain at St. John's, Newfoundland, 10 days from the 16th.

"'The *Persia* calls at St. John's for mails and passengers.

"'No loss of life or limb.'"

The message asking Newfoundland for further particulars was despatched from London at 5 o'clock on Friday evening, and the above reply was received back from Newfoundland at 7·30 p.m.

GOVERNMENT PATENT OFFICE AND LIBRARY.

MR. WOODCROFT, the able Superintendent of the Publishing Department of the Great Seal Patent Office, has issued a circular to the effect that the Commissioners of Patents have taken into consideration the memorials presented to them from engineers and others praying that the Patent Museum at South Kensington may be opened to the public on Saturday evenings between seven and ten o'clock. The Commissioners have communicated with the Lords of the Privy Council for Trade on the subject, and regret to find that such extension of the hours of admission cannot at present be conceded. The Commissioners, however, expect, in a short period of time, to have a museum building under their entire control. The Patent Museum has been open daily to the public, free of all charge, since Tuesday, May 11. The hours of admission are from 10 a.m. to 6 p.m., and in the evenings of Monday, Tuesday, and Wednesday, from 7 to 10 p.m. The Commissioners remind the memorialists that they have established a *free public library* in the Great Seal Patent Office, in which may be daily consulted the specifications or descriptions of all inventions patented in England, Scotland, and Ireland from A.D. 1617 to the present time, together with similar official publications presented by Governments of foreign states. The library includes a large collection of British and foreign scientific journals, and text books in every department of art, science, and manufactures.

It may be stated, for the information of those who are unacquainted with the nature of the Commissioners' publications, that they form in themselves an encyclopædia of mechanics and manufactures of unequalled extent and value, comprising at present not fewer than 1,000 volumes of letterpress and drawings, and increasing at the rate of one large volume per week.

As the indexes to such a vast series of records are in themselves both numerous and costly, short abstracts or abridgments of the specifications of patents, grouped under the different heads of invention, have been prepared and published, and so arranged as to form at once a chronological, alphabetical, and subject-matter index to the class to which they relate.

It is hoped, that the publication of these abridgments will prevent the misapplication of time, labour, and expense in re-patenting what is already known, and, by recording the experience of the past, will direct the energy of the ingenious to improve upon old plans, and to exercise themselves in new fields of labour.

To render the Commissioners' publications as extensively useful as possible, copies have been presented to the authorities of every important town in the kingdom, on condition that the works shall be rendered daily accessible to the public free of all charge.

THE TUNNEL THROUGH THE ALPS.

A LENGTHY Italian document descriptive of the great work of driving a tunnel through the Alps now in progress has been forwarded to us. We have, however, neither the time for its translation nor the space for its publication; we therefore avail ourselves of an article which appears in our excellent contemporary the *Athenæum*, upon this interesting subject, in recording the following interesting facts concerning this colossal operation. The crest of the mountain being 1,600 mètres higher than the culminating point, the sinking of shafts, which is the method generally employed in order to begin boring tunnels at several points at once, was out of the question; hence the tunnel could only be worked at its extremities, so that the labour by the ordinary processes could not be accomplished in less than thirty-six years. Then, how was a depth of gallery of three or four kilomètres, and having but one orifice, to be

aired? These were all serious obstacles. MM. Elie de Beaumont and Angelo Sismonda, having examined the mountain geologically, found it to contain micaceous sandstone, micaceous schists, quartzite, gypsum, and limestone, all easy to blast, the quartzite alone excepted; but the stratum of this is not likely to be very thick; the other difficulties alone therefore remained, and these were at length overcome by three Sardinian engineers, MM. Sommeiller, Grattone, and Grandis, who proposed to turn the abundance of water, for which the locality was remarkable, to account by applying it to a peculiar system of perforation and ventilation, which we will now endeavour to explain. The first apparatus imagined by these gentlemen consists in an hydraulic air-condenser, which is a syphon turned with its orifices upwards, and communicating by one of them with a stream of water, by the other with a reservoir of air. The water, descending into the first branch, enters the second, and by the pressure it exercises condenses the air, which is then forced into the reservoir. This done, a valve is opened, by which the water contained in the syphon is let out, and the operation recommences. The emission and introduction valves are regulated by a small machine operating by means of a column of water; and the air in the reservoir is maintained at a constant degree of pressure by a column of water communicating with another reservoir above. Thus, with a waterfall 20 mètres in height, the air is condensed to six atmospheres, equivalent to the pressure of 62 mètres of water. This condensed air is used for two purposes: first as a motive power, and then for ventilation. Two kinds of perforators, worked by condensed air instead of steam, are employed, one invented by Mr. Bartlett, the other by M. Sommeiller; and "the manner in which these machines perform their duty affords the first practical demonstration of the possibility of employing compressed air as a motive power with advantage."* By means of these perforators, holes for blasting may be bored through the hardest syenite in one-twelfth of the time which would be required if ordinary means were employed. In order to understand the importance of this result it may be stated that in tunnelling three-fourths of the time is employed in boring holes, and the remainder in charging and blasting; hence, accelerating the former operation is an immense advantage. The perforators have another advantage: in a place where three couples of miners would hardly find room, eighteen perforators may be set to work; so that, by these ingenious contrivances, as well as by others for clearing away the rubbish, the perforation of the tunnel may be effected in six years, instead of thirty-six. The air that has been employed as a motive power is used to feed the gallery; but when the latter shall have reached a considerable depth it will require 85,924 cubic mètres of air per twenty-four hours to replace that which has been vitiated by respiration, torches, and gunpowder; and this quantity, in the form of 14,320 cubic mètres of air condensed to six atmospheres, the reservoir can furnish. A new and curious fact has been observed during these works—viz., that when the air, condensed to the degree above mentioned, is shot into the gallery from the machine, any water happening to be near the latter suddenly congeals, although the ambient temperature be about 72 degrees Fahrenheit. Hence, when a large mass of compressed air is driven into a gallery situated at 1,600 mètres below the outer surface of the earth, and where, consequently, the temperature must be about 160 degrees Fahrenheit, the dilatation of the compressed air produces a diminution of temperature sufficient to counterbalance the excess alluded to. The progress now making per day in boring is three mètres on each side of the mountain, or six mètres per day in all.

* Our contemporary is mistaken here, as reference to earlier volumes of the *Mechanics' Magazine* will show.

HILLS' PATENT FOR PURIFYING GAS.

GUILDFORD, AUGUST 14.

(*Before Baron* BRAMWELL *and a Special Jury.*)

HILLS V. THE LONDON GASLIGHT COMPANY.

THE Attorney-General (specially retained), Mr. Montagu Chambers, Q.C., Mr. Hindmarch (specially retained), Mr. C. Pollock, and Mr. Watkin Williams were for the plaintiff; Mr. Bovill, Q.C., Mr. Lush, Q.C., Mr. Webster (specially retained), and the Hon. G. Denman were counsel for the defendants.

This cause began on Tuesday, the 10th, and was not brought to a conclusion until late on Saturday afternoon, the 14th. It was an action brought by the plaintiff against the defendants to recover damages for the infringement of a patent taken out by him for a mode of purifying coal gas from sulphuretted hydrogen by means of hydrated oxide of iron. The declaration also claimed an injunction against further infringement, and prayed an account of the profits made since the action was commenced, and that defendants might be ordered to pay the amount found due.

There were a great number of pleas, but the substantial defence was, that the plaintiff was not the true inventor, and that the invention was not new. After the gas is separated from the coal by heat it contains two impurities, which it is necessary to remove—namely, ammonia and sulphuretted hydrogen. The ammonia is removed by passing the gas through water; and the old method of removing the sulphuretted hydrogen was by means of lime. The disadvantage of this was that there was a large residuum, technically called "blue billy," which was in its nature very offensive and dangerous to health and life, which had to be disposed of; and, in order to do without it, chymists turned their attention to the discovery of other substances that would effect the same result without the same injurious consequences. In the years 1847 and 1848 Mr. Hills, the plaintiff, who is an operative chymist at Deptford, performed some experiments on the subject, and in 1849 he took out a patent for the use of hydrated oxide of iron for this purpose, which he made use of by mixing with sawdust, so that the gas passed through it, the effect thus produced being that the iron retained the sulphuretted hydrogen, and the gas passed in quite pure. This patent also included a mode of reviving the hydrated oxide of iron after it was thus charged with the sulphuretted hydrogen, so that the same material might be used over and over again for 15 or 20 times, some process of revival being absolutely necessary in order to make the use of the oxide of iron of any practical value in consequence of the expensive nature of the material.. Mr. Hills's process of reviving the oxide is a very simple one, being merely exposure to the air, and, if possible, the withdrawal of the pressure of the atmosphere from its surface. This plan, it appears, has been found perfectly successful; but the originality of the invention was disputed, and this action was, in fact, brought in order to establish Mr. Hills's claim as the true and original inventor. It appeared that so early as 1840 Mr. Croll had patented a process of purifying gas from sulphuretted hydrogen, and had in his specification mentioned among other things the oxides of iron, and it was contended that this was a disclosure of that which the present plaintiff sought to patent. In answer to this it was said that there were several forms of the oxides of iron, some of which were hydrated and others are un-hydrous, and that Mr. Hills had specified and patented the hydrated form only, and that, as the process indicated by Mr. Croll for the revival of his oxides only referred to un-hydrous oxides, his specification could not be taken to have divulged as a fact the use of the hydrated oxides. It was also said that Mr. Laming had discovered and made known the use of the hydrated oxide in 1846, and had spoken of it under the name of carbonate of iron, and upon this part of the case there was a great deal of technical evidence.

A mass of scientific evidence was adduced on both sides. On the part of the plaintiff, Professor Taylor, Mr. Dugald Campbell, Dr. Miller, and a number of other eminent chymists and scientific men were examined to prove the originality and value of the invention; and on behalf of the defendant there were Dr. Herapath, Dr. Redwood, Mr. Croll, and Mr. Laming, and several others, whose evidence went to show that the process of the plaintiff was similar to that which had been specified in earlier patents.

The examination of the witnesses on both sides occupied nearly four days, and on Saturday morning the Attorney-General proceeded to reply upon the whole case in a speech which occupied more than four hours.

Mr. Baron Bramwell then summed up the whole of the evidence with great care and minuteness, and the jury after a short deliberation returned a verdict for the plaintiff upon all the material points raised, namely, that his invention was new, and that it was not identical with any of the other processes which had been previously patented.

A number of points of law were, however, reserved, upon all of which leave was given to the defendants to move to have the verdict set aside, so that it is not at all unlikely that there will be a good deal more litigation before the question is finally disposed of.

CAPTAIN KYNASTON'S PATENT SLIP OR DISENGAGING HOOK.

During the late visit of the Board of Admiralty to Plymouth their lordships wished to witness practical experiments of this invention, in consequence of its having been so highly reported on. The *Lark* gun-boat, with a boat so fitted, steamed round the *Diadem*, where their lordships were assembled, dropping her boat by signal, each time she passed under the stern of the frigate, with perfect success. The engines of the *Lark* were then reversed, and the boat dropped with equal success while the *Lark* was going astern with full power.

Sir B. Walker and their lordships were so pleased at the results of these experiments, that they ordered *both* quarter boats of the *Diadem* to be fitted with Captain Kynaston's hooks ere she left the port.

THE IRON TRADE.

(FROM OUR CORRESPONDENT AT WOLVERHAMPTON.)

Improved condition—Marked improvement in the New Districts—Large Rails and castings in Derbyshire—Slow mending in South Staffordshire—French monopoly—Canadian Tariff—Fall of Ten Shillings—Strength of Cast-iron Pillars—Sale of the Smethwick Works—A new Canal Tunnel—The magnitude of the work—Its benefit to the District—Colliers' Strike.

We are able to report an improvement this month in the iron trade of the United Kingdom. There are a few more orders in hand, and the general tone is more cheerful and confident. In Scotland pig iron has increased in value; and at the malleable iron works there, in Yorkshire, Derbyshire, North Staffordshire, and North and South Wales, there has been more doing. Some of these are actively engaged upon a large order for rails for India. The Butterley Company, at Cadnor Park, in Derbyshire, are engaged in the manufacture of some large plates and rails. The rails are of the extraordinary length of 60 feet, and are rolled by an improved process. The foundries at Staveley, also in Derbyshire, are actively employed in the castings for the new brewery of Messrs. Allsopp, at Burton-on-Trent, which is to be the largest brewery in the world. In North Staffordshire a desire is being expressed that there should be an opportunity for the ironmasters to meet "on 'Change" there once a week, and the subject has come under the attention of the Chamber of Commerce of the Potteries. No better illustration can be afforded of the growth of the iron interest in this direction. Throughout the whole of the "new districts" of Cumberland, Yorkshire, and Derbyshire, additional blast furnaces are being put, and some are being blown in.

South Staffordshire is experiencing the improvement, but more slowly than the other districts; the irruption here, at the time of the panic, being of a greater extent and more disastrous in its results than elsewhere. Besides, there is now a rage for "cheap" iron. This South Staffordshire cannot produce to compete with the new districts. With a view, however, to check the rapid passing into other districts of orders that would have come into this, the "trade" houses have agreed to a reduction upon the rates recommended at last quarterly meetings of 10*s.* a ton. The prices of different descriptions now, therefore, commence with £7 10*s.* for bars; but £7 is more frequently the price at which sales are effected by firms not belonging to the association. In low-priced iron there is still a tolerably good business doing with America out of South Staffordshire. Here, however, the makers are engaged principally upon home orders and the trade with the fast-closing ports in the north of Europe. The ironmasters of France are still striving to maintain a monopoly in that country very prejudicial to the interests of the home consumer. An alteration is proposed to be made in the Canadian tariff. Pig iron is added to the free list; plate and angle or other iron, shaped or unshaped, are to be admitted at 5 per cent. only where they form part of an iron ship imported in pieces. To the 20 per cent. are added all iron castings, tubes, and pipes, wrought or cast; spades, shovels, axes, hoes, rakes, forks, and edge tools; spikes, nails, tacks, brads, and sprigs; manufacture of brass and copper, "of which imitation of leather is the principal part;" but brass castings, and other works in metals, finished or unfinished, not otherwise specified, are to be free of duty.

Mr. Eaton Hodgkinson has sent to the Royal Society, of which he is a Fellow, a paper on his experimental researches on the strength of pillars of cast iron, in which he says, "To obtain some idea of the relative strengths of pillars of different British irons, I applied, at Mr. Stephenson's suggestion, to Messrs. Easton and Amos, who procured for me twenty-two solid pillars, each 10 ft. long and 2½ ins. diameter, cast of eleven kinds of iron (nine simple irons, and two mixtures). The pillars were all from the same model, and vertically in dry sand, and turned flat at the ends, as the hollow ones had been, two being cast from the same kind of iron in each case. The simple unmixed irons tried were as below, and all of No. 1.

		Mean breaking weight.
Old Park Iron	Stourbridge	29·50 tons.
Derwent Iron	Durham	28·03 „
Portland Iron	Toirne, Scotland	27·30 „
Calder Iron	Lanarkshire	27·09 „
Level Iron	Staffordshire	24·67 „
Coltness Iron	Edinburgh	23·52 „
Carron Iron	Stirlingshire	23·52 „
Blaenavon Iron	South Wales	22·06 „
Old Hill Iron	Staffordshire	20·05 „

"The mean strength of the pillars from the irons above varies from 20·05 to 29·50, or as 2 to 3 nearly. The pillars formed of mixed irons were found to be weaker than the three strongest of the unmixed series. From many experiments, it was shown that the weight which would crush the pillars, if they were very short, would vary as 5 to 9 nearly."

"Old Park, Stourbridge," we imagine, should be Old Park, Shropshire. The statistics, however, are of no great benefit in a

commercial aspect, unaccompanied as they are by the price paid for iron. For a few shillings a ton, a wonderful difference might, by admixture of ores, be made in any description of iron.

During the month, the sale at the Smethwick Works, of Fox, Henderson, and Co., has been proceeding; and for the machinery high prices have been given.

On the 20th of August, a splendid tunnel made under the Rowley Hills, and 1¾ miles long, was opened in connection with the Birmingham Canal. The tunnel is the finest of its class that is yet known anything of. The width is 27 ft.; 17 ft. of that distance is waterway, and the remaining 10 ft. is divided into two 5 ft. towing paths. The height of the tunnel is 16 ft. above the water, which, in the middle of the channel, is 6 ft. deep. The engineers are Messrs. Walker, Burgess, and Cooper, of Westminster; the resident engineer, Mr. James Walker. The first sod of the tunnel was turned on the 28th Sept., 1855, since which time between 500 and 600 men have been regularly employed upon it. In its working, seventeen shafts were used, some of which were 345 ft. deep. Instead of an 8-ft. dark tunnel, in which men have to lie upon their backs, and "leg" through themselves and their boats, with their twenty tons burthen—an operation taking on an average eight hours—here was a tunnel, with a channel wide enough for two boats, a towing path on each side railed off from the water by strong iron railing, and lighted with gas. There is now no necessity for one boat to wait for the passing through of the train in before it, before a journey can be commenced from the opposite end. Boats can pass each other and perform the whole 3,335 yards in 45 minutes, or one-tenth of the time of the passage of the whole tunnel—in the words of the engineer, "quite as great a difference as between the conveyance of goods by the heavy waggon on turnpike roads and the locomotive engine upon railways."

This tunnel will be a great convenience to the iron trade of South Staffordshire and East Worcestershire. A tunnel rate of 4*d*. per ton will be charged on every ton of merchandise passing through it, until the £300,000 which it and its attendant open works have cost has been repaid; and it will open up about 3,500 acres of ten-yard coal in East Worcestershire that have hitherto remained undeveloped.

A partial strike is now existing among the colliers in South Staffordshire, and East Worcestershire, and Yorkshire, and Somersetshire; but, in the present state of the demand for iron, the strike is not occasioning much inconvenience.

POTTER'S PATENT WINDING-ON MACHINE.

NORTHERN CIRCUIT, LIVERPOOL.

(Before Mr. Baron MARTIN *and a Special Jury.)*

POTTER V. PARR AND OTHERS.

THIS was an action for the infringement of a patent for an improved "winding-on machine" used in spinning. The defendants pleaded that the plaintiff's invention was not new, and denied the infringement.

Mr. Wilde, Q.C., Mr. Hindmarch, and Mr. Ovens appeared for the plaintiff, and Mr. Atherton, Q.C., Mr. Webster, and Mr. Russell for the defendants.

The trial of the action commenced on Friday morning, Aug. 20th, and after continuing all day was adjourned, and was not over until 4 o'clock on Saturday, the 21st.

It appeared in evidence that the plaintiff was formerly a cotton-spinner in Manchester, and the defendants were machinists in the same city. While the plaintiff was in business he observed the great lack of adaptation to the wants of the case which existed in "the winding-on motion" of the self-acting mule used in the process of spinning, and began to reflect on the possibility of inventing an improvement. His first efforts in that direction were put forth in 1829, and by 1836 he had so far succeeded as to obtain a patent for a "winding-on machine;" and then again in 1842 he obtained another patent for another machine for the performing of another part of the winding-on process. The former of those patents expired in 1850, but was extended for five years; the latter patent expired about a year ago. The improvements introduced by the plaintiff consisted mainly in the introduction of a symmetrical curve in such a way as to produce a uniform motion in the rotatory action of the spindles, while the rate of motion in the advancing and receding of those spindles was made to vary so as to form a pyramidal cop. These objects were attained by a spiral drum having attached to it self-adjusting curves, upon which the chain giving motion to the spindles was coiled. [The peculiarities of the machinery in its construction and application were illustrated by numerous models and diagrams.] Witnesses for the plaintiff were called to prove that the application of the principle embraced in the plaintiff's patent was entirely new in 1836, and also that a machine patented by the defendants in 1847 was a direct infringement on the patent held by the plaintiff. The issue raised was whether the machine of the defendants was an infringement, and the object sought by the action was to recover compensation for the

damage sustained in consequence of the alleged infringement. The defence assumed that the main features of the plaintiff's inventions had been employed and even patented before he obtained his first patent in 1836.

Baron Martin, with a view to an arrangement of the case, invited counsel and one witness on each side to confer with him in his retiring-room; but, notwithstanding that Chief Baron Pollock took part in the conference, the case had to go again into court.

Mr. Atherton then addressed the jury for the defendants, and brought forward a mass of evidence in support of the defendants' case to the effect that the defendants' machine was a totally new and improved invention for accomplishing the same results as the plaintiff's machine.

His Lordship in summing up expressed an opinion that the plaintiff's was a good patent, and left it to the jury to say whether the defendants' machine was an infringement of it or not.

The jury were locked up for several hours, and we had not received the verdict on going to press.

SCOTTISH STEAM-BOILER ASSOCIATION.

A PROJECT of an Association for promoting safety, economy, and absence of smoke, in the raising and use of steam for land, marine, locomotive, and all other purposes, in and near Glasgow, has been brought forward by the officers of the Institution of Engineers in Scotland, upon a similar plan to the Manchester "Association for the Prevention of Steam-Boiler Explosions, and for effecting Economy in the Raising and Use of Steam," which comprehends all the principal manufacturers, engineers, and other persons and firms who in any way employ steam, within a district extending thirty-five miles in every direction round Manchester. The Manchester Association has established, by means of inspectors appointed and paid by itself, a regular and efficient system of inspection of all the boilers and engines employed by its members, by means of which it is ascertained whether at any time the condition of any one of those boilers is defective or dangerous, and what steps ought to be taken to render that condition safe,—what are the causes of any accidents which may occur, and the best means of preventing such accidents,—whether the several boilers and engines are working economically as respects the consumption of fuel to produce given results,—and what are the effects of the various methods employed for promoting economy of fuel. The Institution of Engineers in Scotland, from an early period of their first session, have had their attention directed to the complete success and most beneficial effects of the operations of the Manchester Association, and to the great good which would certainly result from the establishment of a similar Association amongst the parties using steam boilers and engines in Glasgow and the neighbouring district, and on the river Clyde and adjoining navigations. The Institution committed the devising and carrying into effect of measures for promoting the establishment of such an Association to their Council. The Council, having fully considered the subject, with the aid of information supplied to them in the most courteous and obliging manner by the officials of the Manchester Association, have come to the conclusion, that the best course for them to take is to call a meeting of all persons and firms in Glasgow and the neighbouring district who employ steam boilers and steam engines for any purpose, to submit to the meeting an outline of the constitution and laws of the projected Association, and to leave it to the meeting to organize the Association in such manner as shall seem best to the majority of those present.

The Council have drawn up for the consideration of the meeting a draught of a body of rules, which, in the main, are identical with those of the Manchester Association, having undergone only a few modifications, of which the chief are, the including of the prevention of smoke amongst the objects of the Association, and of the boilers and engines of steam vessels amongst those to which its inspection is to be extended.

THE NEW GOLD COUNTRY.

(From "The Scientific American.")

SINCE the days when the grandees of Old Spain looked upon the continent of America as a land of gold, and the love of wealth made them forget their family pride, and the time when Sir Walter Raleigh risked his life on the broad Atlantic to visit the western Eldorado—not in a steamship or a modern clipper ship—from these times to to-day this continent has been subject to the best kind of yellow jacks, namely, gold fevers. California has been made by one, and no sooner do we see her rising a prosperous state, and able as it were to walk alone, without the stimulus of gold washing, than a new field is opened up for the restless miner, and gold in plenty is discovered far north on the

Pacific coast. Thousands have left California for the new gold field, which is in the valley of the Frazer river, in the British possessions, flowing from the Rocky Mountains into the Gulf of Georgia. There would seem to be no humbug in the excitement, and the gold discovered has been really astonishing, many miners report having collected almost fabulous quantities of gold. The Hudson Bay Company have the control of this portion of the country, and we are inclined to think that the discovery of gold in their territory, and consequent enormous immigration, will do more to break up this disgraceful monopoly than all the reports which the British House of Commons have been making for the same purpose during the last few years. The Indians who inhabit the district belong to the Chinook tribe, and are already familiar with the whites from their intercourse with British and French trappers, and will no doubt prove of valuable assistance to the miners. We also see that some English capitalists propose to make a great Pacific Railroad in connection with the Grand Trunk of Canada, and their surveyors are already in the field planning the line from Lake Superior through this same territory to Vancouver's Island in the Pacific Ocean. This will increase the value of the gold mines, and render the journey there easy. Imagine the *Great Eastern* to Portland, railroad to Montreal, crossing the Victoria Bridge, from thence by boat and rail to the Pacific—only seven thousand miles by steam—through the finest scenery in the world, and over the greatest engineering triumphs mankind has ever seen. Truly America and England are great countries, and the people *rather* go-ahead.

THE ATLANTIC TELEGRAPH CABLE.

Gentlemen,—If the accounts of the experiments made on the Atlantic telegraph cable published in the *Morning Post* of the 19th inst. can be depended on, there is no difficulty, in my opinion, of explaining the cause why the cable has not proved as successful as would be desired, and I hope, therefore, you will excuse me for taking this liberty to suggest a remedy. The wire of the cable should not be in close connexion or union with the insulating substance; it ought to be parted from it by means of having the wire covered with some imperfect conducting substance, such as linen or cotton, coiled several times round the wire before the gutta percha covering is put on. It is quite manifest the reason why small wire succeeds best is that a much smaller surface of insulating matter is acted upon with a small wire than would be with a larger one. If the quantity of insulating surface in close contact with the wire of a cable 2,000 miles long be calculated, it will be found very considerable, and it is surprising, indeed, how it succeeds so well, and the enormous pressure of the water assists in doing mischief by making the union of the wire and gutta percha more perfect.

In the experiment performed on 2,000 miles of coiled rope in the yard, I am not surprised the experiment succeeded, when we consider the well-known property of currents in passing through coils of wire. The electricity under those circumstances has a powerful influence of accelerating and increasing the electrical influence, as to overcome the obstacles above mentioned, caused by induction, and to pass messages with the usual success and speed.

One most important fact stated by the author of the article in the *Morning Post* is well deserving of notice. It is, that, on all occasions of signalling, the first signal always passed instantaneously, proving that the wire was sufficiently thick, and that the retardation was caused by the induced electricity in the surrounding covering. The iron was very properly prevented from coming in contact with the gutta percha, and, in my opinion, was not the cause of the retardation.

In conclusion, Gentlemen, to prove to you that I am not intruding my opinions on your notice without being qualified, on an abstruse and intricate branch of science, I beg to observe, that Dr. Faraday, as for back as the year 1831, published in the *Philosophical Magazine* of that year a letter of mine, which I took the liberty to send him, describing an important experiment, then for the first time made, and therefore, in some degree, I may be said to have enlarged the branch of the science, and therefore my suggestions are not, I trust, now undeserving of being attended to.

I am, Gentlemen, yours, &c.,

P. M.

Dublin, Aug. 21, 1858.

GEOLOGICAL DRAINAGE.

Gentlemen,—In troubling you with a few words in reply to your correspondent J. A. Davies, who begins by saying, "I must confess that I see many things in the way of Mr. Crickmer's scheme proving successful," I beg to observe that this was said of the first steamboat that was launched; it was said of the first railway engine that was constructed, seeing that even the House of Commons ridiculed the idea of the great Stephenson, that a locomotive might be made to travel safely at ten miles an hour; the same was also said

recently of the great Atlantic cable: yet these are now all accomplished facts. Are we all at once to stand still? Is science to be at fault in carrying out a great scheme, second to none in importance, for ridding ourselves of the sewage of this metropolis? Is there anything dangerous or inconsistent in calling to our aid the laws of nature—that great worker for the good of mankind? Would your correspondent have us taxed for the next forty years for carrying out a scheme which, even if successful, it being more than doubtful, involves, in addition to the enormous outlay for carrying it out, an annual charge of something like a hundred thousand pounds, whilst we have at our feet, already made, a channel through which we can discharge the whole of our liquid sewage far out at sea? The practicability of this scheme is an established fact, for it has actually been in successful operation in France for the last sixty-eight years, and is rapidly extending itself; and I myself had it in successful operation on my own premises for a period of seven years. But, independent of all this, is it not a heavy responsibility for the Board to incur by spending the money of the ratepayers in carrying out a scheme that involves the outlay of millions, and will obstruct the traffic of London more or less for the next five or six years, when a scheme is offered which can be tried at once for three or four hundred pounds, and, if carried out, can be effected in one-sixth the time, and at a cost of less than one million, and, in addition to this, a revenue derived from the solid sewage matter being properly deodorized, which will pay all the annual charges of the sewage operations, and, I do not hesitate to say, leave a surplus?

I will not trouble you with many remarks in reference to your correspondent's objections, for herein are the contradictions, which are too apparent to have much weight. It is sufficient to know that it is successful on the Continent; wherefore should it not be so in London, with greater facilities in respect to the formations of the great London Basin?

I will confine myself to one or two remarks. Your correspondent, in reference to the liquid sewage, says, "It may *rest* upon clay and other impervious formations in such a way as eventually to reach the sea; but to lay it down that such would always be the case is more than I fancy Mr. Crickmer can prove." Neither can Mr. Davies prove that the river Thames will always continue to flow; we can only draw inferences. The Thames has been flowing for ages; hence we infer that it will continue to flow to the end of time; but 'tis more than man can prove. But I will dismiss this at once, by replying that if it (the liquid) rests upon clay and other formations it never can reach the sea, for if at rest it cannot be in motion; and further I would remind your correspondent on this point, that nature is ever active, and her operations uniform. With respect to the "perpendicular descent of the sewage to a seaward-inclined strata," the imaginary "cavities," the "tenacity of sand," the coating of slime, on all of which your correspondent writes so confidently, and sets forth as the obstacles on which the practicability of my scheme is to be at once overthrown, I need only remark that it furnishes evidence that he has written on a subject with which he is unacquainted; and, this being so, it would give me much pleasure to enlighten him upon the subject, which, if he will favour me with a call any morning, I will do by submitting to him my drawings and plans, with such statistics and information as will, I think, cause him to arrive at different conclusions from those he has at present arrived at. Apologising for the length of this letter,

I am, Gentlemen, yours, &c.,
RICHARD JEX CRICKMER.

101, Borough-road, Southwark,
18th Aug., 1858.

BREECH-HOOPED CANNON.

GENTLEMEN,—Although I have already called your attention to my various modes of constructing and strengthening cannon, now the subject of hooping is engaging the attention of the War Office and the Ordnance Committee at Woolwich, I beg again to be permitted to repeat, *the value of the principle is dependent on the way it is practically carried out*, and it frequently happens that the most valuable improvements are defeated by inappropriate experiment.

As the new works at Woolwich give the Government ample opportunity to test the true value of strengthening cannon by hooping the breech, I respectfully consider it advisable to call to their assistance, *pro tem.*, highly experienced men in the nature and working of iron, to assist in the hooping of guns, for example; and it must be understood that I make not the slightest allusion to myself in thus recommending it, conscious as I am, within the vicinity of Woolwich, there are gentlemen whose experience in this respect is far greater than I presume to have, and engineers in general. The statement in your No. 1828, page 182, is literally correct, that I first recommended it for restoring to the service the otherwise lost re-bored cannon. At that

date, serious complaints were made in the professional journals by officers and gentlemen in the service, for spoiling, as they considered, well-tested ordnance by enlarging the bore for firing shell and hollow shot; and, had I not known something of the working of iron, probably I should not have recommended the hooping.

The plan with me was a pure invention, for at that date I knew nothing more of ordnance than what I found in general use in the service, and I may add other services, as nothing in the form of made-up guns had been brought under my notice, and I am glad to see that very able men have also considered the principle of hooping sound and valuable. At the time I visited the Committee in 1854, and since in company with Dr. Drake, I had my hooped and other cannon with me, since which, the Committee have proved, to a certain extent, the value of the principle clearly in the instance of Captain Blakely, R.A.; and a correspondent in your last Number, p. 183, gives a striking instance of the strengthening of *glass tubes by hooping*, in corroboration of the validity of the principle.

Mr. T. Howard, who is also named, gave important evidence on the subject some months since, which induced me to call on that gentleman, when we had some discussion on the hooping of ordnance, and on the best way it is to be performed. Having described some time since my hooped and built-up ordnance, I will not take up your space in repeating it; but, as the Select Committee is now engaged on the subject, let us hope that they are engaged rightly, and that prejudice and inexperience will not stand in the way of success. Let us not reflect on them for the neglect of their predecessors; but, seeing them sensible of the necessity of strengthening cannon by hooping and otherwise, I trust I feel it right to give my assistance in the best way I am able, and will cheerfully do so to the extent of my ability; but, in the name of common justice, let that dishonourable practice of adopting in the service of the country the inventions of those who have, by official instructions and in good faith, submitted plans for its improvement, as a *matter of right*, because justice was refused at the time, be now and for ever abandoned.

The Government is perfectly right, as one of its heads once told me, to adopt any invention for the good of the country without considering who was the inventor, but neither the country nor its institutions recognizes that right at *the expense of justice.*

I am, Gentlemen, yours, &c.,
JOHN POAD DRAKE.

London, Aug. 21, 1858.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

BADGE, R. J. *Improvements in machinery or apparatus for drawing or extracting spikes or trenails from railway sleepers and chairs, and other similar purposes.* Dated Jan. 16, 1858. (No. 71.)

In order to extract the ordinary trenail the patentee bores a hole in or near its centre. Into the said hole he forces a screw, the said screw having a head formed so as to be adapted to the tool by which the power is obtained to force the screw into the trenail. To the aforesaid screw he attaches by means of a joint another screw fitting a nut or thread at the top of a tube or frame, the screw passing through its interior. The aforesaid tube or frame forms the resisting medium, its lower part resting on the chair from which the spike, &c., is to be drawn, the extraction of which is easily accomplished by turning and raising the screw in the tube or frame.

AUSTIN, J. *Improvements in machinery or apparatus for ploughing or cultivating land.* Dated Jan. 16, 1858. (No. 72.)

Under one modification this consists of a triangular open frame on wheels, having at the forward end an upright steam engine and boiler. The overhead crank shaft is connected by toothed and belt or chain gearing with the main forward ground wheel, which has projections to take a firm hold of the soil. This wheel is also the steerer, its vertical spindle having at its upper end a horizontal worm wheel, in which is geared a worm worked by a steering wheel. The extreme back of the framing consists of a pair of ploughing guides, carrying a set of four large chain pulleys, over which are passed two endless chains. The two contiguous chain pulleys are actuated in reverse directions, so that the forward traverse of the machine at right angles to the lines of furrows bears a determined relation to the rate of the ploughing chains at right angles with this forward traverse. Each chain or belt is fitted with ploughs which, as the machine works, continually enter the ground to plough it up in their bottom traverse, and emerge from the ground to return free in their uppre back traverse. This plough always works with its ground wheel or wheels upon the unploughed ground. When it is to be conveyed from field to field, the two ploughing frames are folded back, so as to form in the whole one long running frame, easily portable.

ARCHIBALD, R. *Improvements in the treatment or preparation of wool and other fibrous materials for being spun.* Dated Jan. 16, 1858. (No. 73.)

This consists of various arrangements whereby the woollen rolls or cardings, as delivered from the carding engine, are properly and evenly pieced or joined together, so as to form the uniformly continuous lengths of rolls required in the subsequent operation of spooling.

HILLS, E. *An improved process for manufacturing sulphate of ammonia.* Dated Jan. 16, 1858. (No. 76.)

This consists in the production of sulphate of ammonia by the direct action of sulphuric acid gas on any ammoniacal liquor or vapour, such as gas water, stale wine, bone liquid, or any liquid substance or vapour containing ammonia.

BROSSE, C. A. DE L. DE LA. *Improvements in apparatus or machinery for the manufacture of looped or knitted fabrics.* (A communication.) Dated Jan. 16, 1858. (No. 78.)

The seams of looped fabrics, produced by the machines now in use, are sewn or made by hand after leaving the machine. By this invention, stockings and other articles when they come from the machine are sewn into the proper shape.

BROOMAN, R. A. *Improvements in machinery for the manufacture of pipes and tubes.* (A communication.) Dated Jan. 18, 1858. (No. 80.)

This relates to making copper tubes, and consists in a machine so constructed as to form the

tube out of an ingot or casting by rolling it upon a stationary mandril, the metal being stripped from the end of the mandril by the action of the rollers as it passes between them.

HAMILTON, T. and J. *Improvements in holders or bobbins for holding or containing yarn or thread, and in turning, cutting, shaping, and reducing wood and other substances.* Dated Jan. 19, 1858. (No. 81.)

This relates chiefly to the use of small cylindrical, conical, or taper wooden tubes, to act as cop bottom holders, or the fundamental bases of copped or wound-up yarn as required in various branches of textile manufacture. These holders are turned out of rough wooden blanks by machinery, and they are principally suitable as the supporting bases on which to wind the lowest strata of yarn in the formation of cops, so that, when the yarn comes to be wound off in the process of manufacture, either by weaving in the shuttle or otherwise, the whole of the yarn can be properly taken off and turned to available account. There are various modifications included.

WALKER, A. and T. *Improvements in the treatment or preparation of moulds for casting metals.* Dated Jan. 19, 1858. (No. 82.)

This relates to the treatment of the surfaces of sand moulds by anthracite, "blind," or "stone" coal dust. The coal is used in its natural condition, being merely reduced to dust. The dust is placed in permeable bags, and dusted upon the mould surfaces with which the metal will come in contact. The same material may be used as a wash for moulds. The result is economy in the materials used, and the production of exceedingly sharp and fine castings.

WILSON, E. *Improvements in pistons for steam engines driven by steam or any other elastic fluid, which improvements are also applicable to the pistons or plungers of pumps.* Dated Jan. 19, 1858. (No. 83.)

These consist in applying one metallic packing ring only, the joint of which is a compound half lap joint, and may be placed in any position of the piston, &c., and prevented or not moving therefrom by a stop pin. The packing ring is placed in a recess turned in the piston head or plunger, and is forced against the internal surface of the cylinder, and rendered steam, air, or water tight by its own elasticity.

WALLER, W. *Improvements in machinery for grinding, bruising, breaking, and cutting cereals, grasses, and other vegetable substances.* Dated Jan. 19, 1858. (No. 84.)

This consists in the use of annularly grooved recesses or corrugated wheels, pulleys, or rotating discs for bruising, breaking, and cutting cereals, grasses, &c., the peripheries of such wheels, &c., being formed with grooves, recesses, or corrugations occupying the usual position of the teeth of gearing wheels.

WALLER, W. *Improvements in thrashing machines, or machinery for thrashing and dressing grain.* Dated Jan. 19, 1858. (No. 85.)

This invention cannot be described without engravings.

TIVOLI, V. DE. *An improved omnibus.* Dated Jan. 19, 1858. (No. 86.)

The patentee claims, 1. Constructing vehicles having their seats or some of them arranged in two parallel rows placed longitudinally, the passengers of the two rows sitting back to back, facing either side of the road, which arrangement, by allowing sufficient height between the level of the road and the seats, admits of the application of De Cristofori's patent conical wheels. 2. Folding steps in combination with certain hand rails, whereby passengers are enabled to have access to each compartment of the vehicle direct from the street.

TREMESCHINI, G. A. *Improved methods and mechanical arrangements for applying cardboard to the weaving of figured fabrics, and for arranging the cardboard for this purpose.* Dated Jan. 19, 1858. (No. 88.)

This consists, 1. In substituting for the transverse Jacquard cards longitudinal strips of thin cardboard placed side by side. 2. In substituting for the ordinary Jacquard apparatus for applying the said strips a proper mechanical arrangement. 3. Certain methods for the reading and designing of the pattern, and the perforating of the strips of cardboard.

WELLS, B. B. *Improvements in ordnance.* Dated Jan. 19, 1858. (No. 89.)

This consists in constructing cannon so that the piece of ordnance may be used as a cannon, or may have parts removed, and be then used with additions as a mortar. Also, in forming ordnance in segments; in making the bore of the gun composed of segments gas-tight; in means of rifling; in the construction and fitting of trunnions to guns; also in minor details, which cannot be described without engravings.

PIRIE, T. *Improvements in machinery or apparatus for thrashing or separating grain.* Dated Jan. 19, 1858. (No. 91.)

This relates to the drum of thrashing machines. This drum has fitted to it angled feathers, disposed in parallel rows over the drum surface, each row having its individual feather pieces set at an angle the reverse of its neighbour. These feather pieces act the part of the ordinary solid beaters, and they effect the thrashing action with less power than is required in the common apparatus, and they are less liable to bruise the grain and straw. The front end of such feather is tapered off to aid this gentle action, whilst the reverse disposition of the inclined pieces causes the grain to be cleared well off. There are other features included.

CORVIN, O. V. *Improvements in the mode of inlaying or ornamenting in metals and other materials.* Dated Jan. 19, 1858. (No. 93.)

These relate to a means of inlaying by means of galvano-plasty, or by using metal in a molten state, and compressing it in that state into the interstices into which it is to be inlaid.

NIXON, C. N. *Improvements in the application of screw power, such improvements being applicable to steering apparatus, capstans, windlasses, cranes, winches, and other mechanical purposes.* Dated Jan. 20, 1858. (No. 94.)

In ships with round rudder heads, the upper part of the rudder head is surrounded by a metallic wormed collar, securely held to the deck by clamps, &c., but so as to allow of the partial revolution of the collar from right to left, or *vice versâ*, and so constructed that the rudder head may move up and down within the collar. The collar is provided, as to two portions of its external periphery, with teeth, the teeth on the respective sides of the collar being inclined in the reverse direction to those on the opposite side, so as to correspond with threads of right and left handed screws which take into the same. The screws should be of metal, mounted at the ends thereof on pillars fixed to the deck, such pillars having bearings in which the ends of the screw spindles can freely work. The screws are moved simultaneously by cog wheels with suitable leaves, actuated by the revolution of the steering wheel, thus giving motion to the wormed collar, which, grasping the rudder head, causes the same to move towards either side of the ship to the angle required, the extent of such motion being determined by the proportion which the toothed or wormed segments respectively bear to the circumference of the wormed collar. There are various modifications included.

MARTIN, R. *Improvements in machinery or apparatus for effecting the shipping of minerals in tidal situations.* Dated Jan. 20, 1858. (No. 95.)

In shipping coal by this apparatus the waggons are run up at right angles to the pier head, until they come upon a balanced tipping frame set on centres, and fitted with counter-weights and frictional brakes, so that, when the waggon is run on to the frame up to the outer curved stops of the rails, the coal is tipped out at once. As the coal falls from the waggons, it descends upon the land-

ward end of an articulated shoot. This shoot is in several pieces jointed together, and is wound upon a square barrel, the shaft of which is set in end bearings in the pier head. In this way the shoot is wound up or let down to suit the level of the water in the tidal way, and is available for service in all states of the tide.

HEPPLESTON, T. *Certain improvements in machinery or apparatus for winding yarns or threads.* Dated Jan. 20, 1858. (No. 96.)

This relates to "pin-winding machinery" for winding yarns upon "pin bobbins" for weaving, and is chiefly applicable to machines wherein the the bobbins are inverted, and consists, 1. In a method of stopping the spindle and bobbins when sufficient thread has been wound upon the bobbin without stopping or disconnecting the drawing power; this is effected by securing a "fast and loose" pulley or wharve upon the spindle. 2. In the use of a spindle having a bearing on the lower rail, and driven in the ordinary manner, the object being to lift or detach the bobbin when full from the revolving spindle.

MUIR, W. *Improvements in stands for letter-copying presses and other small machines.* Dated Jan. 20, 1858. (No. 97.)

Here the bottom plates thereof have holes to receive the legs of the stand or the bolts, which legs are made of iron, and are connected by stretchers, or by the supports for the drawers, or by both.

RISHWORTH, C. *An improved construction of spring for sustaining loads and moderating concussions.* Dated Jan. 20, 1858. (No. 100.)

The patentee claims the combination of parts whereby the action of the spring or elastic medium is called into force in a direction at right angles with the direction in which the strain or force is applied. The invention cannot be described without engravings.

BROOMAN, R. A. *Improvements in the preservation of animal and vegetable substances.* (A communication.) Dated Jan. 20, 1858. (No. 101.)

These consist in coating animal and vegetable substances with a compound formed of vegetable albumen and a suitable antiseptic material.

RUSSELL, J. J. *Improvements in apparatus used in the manufacture of welded tubes.* Dated Jan. 20, 1858. (No. 102.)

Here, a series of dies are carried by an axis so that, as soon as one of the dies has been used, it is caused by a partial rotation of the axis to descend into a trough of water below, whilst another die comes into position to have a tube drawn through it, and it is preferred that each die should consist of two parts, one of which, when a die comes into a position to have a tube drawn through it, is closed up to the other part and retained secure by means of a lever and suitable catch. The means of opening and closing the parts of dies may be varied. There are modifications included.

ROBERTSON, P. *Improvements in the manufacture of paints.* (A communication.) Dated Jan. 20, 1858. (No. 104.)

Here, lime is slaked by applying water thereto in a close vessel. To the slaked lime sugar is added, also boiled molasses, whiting and dry white lead are then introduced, also salt and refined borax. The compound is allowed to stand for some hours, it is then ground in a mill, and ready for use. When coloured paints are required, the proper colouring matters are added.

WHITE, W. *Improvements in machinery or apparatus for making moulds or matrices employed in casting metals.* Dated Jan. 21, 1858. (No. 106.)

This relates to apparatus for ramming the sand, &c., round the platten used in preparing moulds for casting metals, and consists of a framing or pair of standards carrying an overhead shaft, fitted with appliances for driving the same, carrying also one or more eccentrics, cranks, or cams, for giving a vertical ramming motion to a corresponding number of packing rams. These rams are connected by rods to their actuating eccentrics, &c., and work in guides to insure their moving accurately and without vibration. The mould boxes are on travelling tables, having each a longitudinal toothed rack fitted beneath it, which gears into a corresponding spur wheel, carried by a second shaft below the tables. This shaft has a rocking motion imparted to it by cranks or levers fitted to the extremities thereof, to which cranks or levers is imparted an intermittent rotary, vibratory, or oscillating motion from other cranks or eccentrics carried on the ends of the upper or eccentric shaft, the two sets of cranks being connected by side rods which are slotted for allowing the tables to be stationary during the descent of the rams. The mould having been rammed, the table moves forward by the action of the spur wheels and racks or levers, and a second mould is thereby brought under the action of the rams.

IVORY, T. *Improvements in steam boilers.* Dated Jan. 21, 1858. (No. 107.)

This consists in heating no more water at a time than is necessary for generating the quantity and pressure of steam required by the engine, and conveying as it is generated all the steam produced by that body of water immediately into the engine, to act as a moving power, means being adopted to keep up a continuous supply of fresh water to replace what is converted into steam, so that the steam-generating body of water shall preserve always, as near as possible, the same level.

WILSON, P., S. NORTHALL, and T. JAMES. *Improvements in locks and latches.* Dated Jan. 21, 1858. (No. 110.)

This consists, 1. In fixing a roller on the end of a latch bolt or on the end of a latch and lock bolt. 2. In a method of constructing the follower of latches. 3. In a method of constructing a detector lock; that is to say, a lock which, when a false key is introduced and made to withdraw the bolt of the lock, is so operated upon by the false key that although the bolt of the lock is withdrawn a second bolt is shot out, and prevents the opening of the door. The second bolt may be withdrawn, and all the parts restored to their proper positions by the introduction and turning of the true key. 4. In making lock or latch spindles of a triangular form.

SMITH, H. *An improvement or improvements in the manufacture of iron hurdles and fencing.* Dated Jan. 21, 1858. (No. 112.)

The patentee claims securing the horizontal bars to the standards or right up by rivets, wedges, or cotters.

BROWN, J. S. *Improvements in mills for grinding corn or other substances.* Dated Jan. 21, 1858. (No. 113.)

This consists, 1. In combining metallic with stone grinding surfaces. The patentee forms the central part of both the upper and lower grinding surfaces of metal grooved or roughened; and round this metallic central part he places sections of French burr stone, arranged so as to form a ring all round the central metallic grinding surface. All the parts are secured together so as to form a compact whole, but he provides openings between the central metal surface and the stone outer ring, for admitting air between the runner and the bed stone, for keeping the grinding surfaces cool. The metal surface is so mounted in the frame that holds the parts together as to admit of its grinding surface being accurately adjusted by screws at the back. 2. It relates to the mode of constructing the metallic grinding surfaces, and of applying them to the other parts, and consists in forming these surfaces of separate sections composed of thin plates of steel provided with bevelled edges. These plates are all of the same height, and are set vertically on edge on a flat bed plate. These steel plates, when assembled and secured together in sets, may be arranged with their cutting edges placed in proper directions, and having plain blocks of less altitude introduced between the sets of cutting blades, so as to form channels analogous to those made in ordinary

millstones. The use of the metallic surfaces at the central part of the stones is to cut up or nearly reduce the corn, &c., in the first instance, and from these metallic surfaces the coarsely pulverised substances will pass to the annular French burr or other stone which surrounds it, and will be reduced by the stone grinding surface to a fine flour, and be ultimately delivered at the periphery of the stone in the ordinary manner.

CLARK, W. *Improvements in lubricating apparatus.* (A communication.) Dated Jan. 21, 1858. (No. 114.)

This relates to oil boxes for lubricating axles, &c. This oil box contains, at its lower part, 1. An oil box, properly so called, lubricating the axle journals or bearings by a capillary pad placed in an upper reservoir or chamber. 2. A lower reservoir into which the oil enters when it drops off the journal, which oil may be used again. It contains at its upper part an ordinary grease box, which is intended to serve as a grease box when the oil box cannot be used from any cause.

BROWN, J. *Certain improvements in looms.* Dated Jan. 22, 1858. (No. 118.)

Th s refers to looms which are used for ribbon and silk weaving, and consists, 1. In improved forms of shuttles, by which the inventor is enabled to convey one, two, three, or more shuttles through the fa ric, thus throwing several shoots of various colours simultaneously, and by which he also gains considerable advantage in the batten, as these shuttles enable one to make a much wider fabric with a shorter shuttle, and also to make a greater number of pieces at one time, and within the same space. Thus he can make with the same loom fabrics of varying widths. 2. In affixing a peculiar guide to the breast piece of the loom, through which the fabric will pass perfectly flat, and thus be prevented from twisting.

BROWN, J. *Certain improvements in Jacquard machines.* Dated Jan. 22, 1858. (No. 119.)

This has reference to Jacquard machines, but especially those employed in weaving silks and ribbons; and relates, 1. To the use of a double hook in Jacquard machines, whether such machines be worked by barrel or card. By the use of them either one, two, or three sheds may be produced at the same time, and in either of the positions known in the manufacture as rising, falling, or standing, thus allowing one, two, or three colours to be introduced into the fabric at one and the same time, enabling the operator to produce on either side of the fabric ornamental, brocaded, or other figures. 2. It consists in the application of three lifts or gratings, and these gratings are also capable of assuming either a rising, falling, or standing position, as already named with respect to the hooks.

BASFORD, W. *Improvements in kilns or ovens for burning or firing bricks, tiles, pipes, and pottery or earthenware, and in the mode of charging the ovens or placing or setting the articles that are to be fired therein.* Dated Jan. 22, 1858. (No. 120.)

There are a variety of improvements included in this invention, the chief of which appears to be making the mouths and fire draughts of smaller dimensions than usual, and increasing their number so as to reduce the space between them, thereby obtaining a more uniform and regular heat throughout the oven than heretofore.

STEBBY, A. *Improvements in safety lamps.* Dated Jan. 22, 1858. (No. 121.)

Here the wire gauze which surrounds the flame is made into a globular form; the upper part being of a cylindrical or other shape. The oil is forced up to the wick by a piston acted on by a spring, so as to cause the supply of oil to the wick to be in excess, so that it may overflow as in "Moderateur Argand Lamps," and the internal construction of the lamp is similar to that of an ordinary moderateur lamp. There are modifications included.

WEILD, W. *Improvements in machinery for winding yarn or thread on to bobbins, spools, cards, or other similar surfaces.* Dated Jan. 22, 1858. (No. 122.)

This relates to machinery for spooling sewing thread, and consists, 1. In arrangements added to the common spooling head to render it self-acting, so far as regulating the distribution of the thread as it is wound upon the bobbin spool card and stopping the machine when the required quantity of thread has been wound. 2. In one or more heads, by which the bobbin spool or card when full may be removed and replaced by an empty bobbin spool or card, by the simple movement of a handle. 3. In mechanism added to those referred to under the last division, and applicable to machines of one or more heads which, by the movement of a handle, will cut the thread and secure it to the full spool, and arrange the thread so as to wind on the empty spool when the machine is again put in motion. 4. In a machine combining the improvements before referred to, and rendered completely self-acting, so as to require to be supplied only with thread and empty bobbins, spools, cards, or other similar surfaces.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

MACBETH, G. *A certain improvement applicable to sewing machines.* Dated Jan. 16, 1858. (No. 74.)

This relates to sewing machines for "binding" the edges of wearing apparel, &c., and consists in a curved guide, which is adjustable upon the framing of the machine, and placed immediately before the vertical needle, so as to deliver the fabric thereto. This guide is curved, the end furthest from the needle being of a width to admit the full width of the binding, and gradually tapered towards the needle to about half the width, the edges of the guide being turned inwards to retain the edges of the braid. Upon the braid passing through this guide, it will be gradually doubled round the edge of the fabric, which also passes between the grooved or tapered end of the guide, and, as the fabric is delivered from the guide with the braid around its edge, the needle descends through the braid and fabric, secures the braid thereupon, and produces a bound edge.

HYDE, F. *Improvements in machinery or apparatus for spinning, doubling, twisting, or throwing cotton, silk, wool, flax, and other fibrous substances.* Dated Jan. 16, 1858. (No. 75.)

Here the thread, &c., is caused to regulate its own drag, so that the strain upon it is always equal. To effect this a flyer is placed upon the spindle, but not fixed thereto. This flyer is driven by a motion produced by the friction of a wharve against a disc or face-plate of leather made to revolve at the required velocity. Upon the wings of the flyer is a washer of leather so made that the cop or bobbin can pass through the inside diameter, and the outside diameter exceeds the span of the flyer by about a quarter of an inch. This washer slides up and down the wings of the flyers, by the outer edge being introduced into a slot fastened to the lifter. An eye is attached to the washer, through which the thread, &c., from the cop or bobbin upon the spindle passes to the delivery rollers. A separate motion causes the spindle to revolve slower than the flyer, which latter carries the washer round with it, so that the thread carried round by the eye of the washer winds itself round the cop or bobbin upon the spindle. If the strain upon the yarn be greater than required, it causes the friction of the washer inside the groove or slot to retard the motion of the flyer, and so brings it to the drag intended. The retarding strain of the thread, &c., can be adjusted by varying the pressure

against the sides of the leather disc or face-place which drives the flyer.

ROBERTSON, P. *Improvements in lamps.* (A communication.) Dated Jan. 16, 1858. (No. 77.)

The hydro-carbon or other fluid is contained in an inner vessel of india rubber. This inner vessel is of smaller dimensions than the vessel of glass, &c., which contains it; hence, in the event of there being pressure on the interior, the vessel will not burst, and, in the event of the outer vessel being broken, the liquid will not be spilled. When using burners with wick tubes, such tubes are fixed to a disc which rests on an inner ledge on the upper part of the lamp, and such tubes pass up through two tubes fixed to the cap, which is removed when the lamp is to be filled with fluid; there is a spring introduced under the under surface of the cap and the upper surface of the disc, thence the cap cannot be removed without extinguishing the flames at the upper ends of the wicks. The spring is around a hollow pin fixed to the underside of the cap. The lamp cannot be supplied with liquid without extinguishing the flame.

ROSA, E. *Improvements in the manufacture of dough and other plastic or porous substances.* Dated Jan. 16, 1858. (No. 79.)

This relates to the raising of dough by the combination of common air, carbonic acid gas, oxygen, nitrogen, hydrogen, or other gases with the wheaten or other flour and water.

BRUFF, P. C. *Improvements in the construction of submerged tunnels.* Dated Jan. 19, 1858. (No. 87.)

This consists of metal tubes made in sections, such tubes resting upon the bottom of rivers, &c. The tubes may be of cast or wrought metal. They are made in sections, and protected from corrosion by any of the known appliances. They may be of one, two, or more thicknesses, and with keelsons of angle iron, the whole bolted together.

JOHNSON, J. H. *Improvements in the boxes and journals of carriage wheels and axles, and in journals and bearings generally.* (A communication.) Dated Jan. 19, 1858. (No. 90.)

Here, in the case of carriage wheels, greater facility is afforded for removing and replacing the wheels, and in all cases the lubricating chambers are entirely protected from the accidental admission therein of dust, grits, &c. The method of carrying this invention into effect depends upon the construction of the axle or journal to which it is applied.

CAPON, P. *Improvements in apparatus for binding together pamphlets, letters, music, and other loose documents or sheets.* Dated Jan. 19, 1858. (No. 92.)

This relates to apparatus in which a metallic back or frame is employed having pins or prongs on which the papers are threaded and held by a bar pressing thereon by the force of springs, and consists in the use of india-rubber springs in lieu of the metal springs for forcing the papers on the prongs.

DAVAGE, C. and T. *Improvements in railway crossings.* Dated Jan. 20, 1858. (No. 98.)

This invention cannot be described without engravings.

DYSON, J., E. W. SHIRT, and H. SHIRT. *An improved construction of spring for resisting sudden and continuous pressure.* Dated Jan. 20, 1858. (No. 99.)

This consists in the use of plates of steel to neutralise the effect of concussion. The inventors employ a box, in which are fitted a series of segmental and straight plates hardened and tempered. They are placed alternately with the extremities of two curved plates bearing against an intermediate straight plate, and the convex surface of the outer curved plate in contact with the convex surface of another, the rest of the series consisting of two curved plates with an intermediate straight or chord plate, against which the extremities bear. The thickness of the plates diminish from the point of ultimate resistance to the outer plate of the series, or point where the pressure is first applied, the outer plates yielding with comparatively little pressure.

WHEATLEY, J. H. *Improvements in printing machines.* Dated Jan. 21, 1858. (No. 105.)

These consist in combining the essential features of the cylinder machine with those of the platten or tympan machine, obtaining the speed of the one and the accuracy of the other. The tympan is similar to that of the Stanhope printing press, and is used with a cylinder. The printing tables are placed under the cylinder and tympan. On these tables the type is placed, and they are worked backwards and forwards by a cam fixed on a shaft underneath the printing tables. This cam is fitted with one stop which is used to allow time to lay the sheet on the tympan preparatory to being printed, and also to remove it after this operation is completed. The stop is part of the periphery of the cam cut away in a slightly circular form; it allows time to lay the sheet on when the tables are out to the extent they are allowed to go. The inventor prefers one stop in this cam instead of two. The cylinder is allowed to rise and fall a little in its bearings, and the springs are provided to assist this vertical play.

ROBINSON, J. J. *Improved apparatus for sorting and stamping letters, books, newspapers, and other articles.* Dated Jan. 21, 1858. (No. 108.)

This consists of a table with a cage for the letters, &c. At the two ends of the machine are two drums for carrying bands at suitable intervals apart, the one drum for passing forward the letters, &c., and the other for holding them while being stamped. The first drum or the tooth wheel on the axle of the stamping apparatus sets in motion a roller carrying projecting pieces or stirrers suitably padded and arranged in rows at equal distances round the circumference thereof, and also at equal distances from each other in the rows. The roller in which they are inserted is mounted on bearings, which admit of its axle being raised or lowered to suit the varying thicknesses of the articles to be passed under the stirrers by the feeding bands in one stream, the action of the stirrers preventing them from passing, and throwing back all articles of greater thickness than the space between their ends and the feeding bands under the same, and thereby also separating the articles one from over another. The stamping apparatus is arranged between the holding drum to which the articles are carried by the feeding bands and the inking roller, so that the stamps may be successively brought into contact with the latter to receive the charge of ink or colour, and then with the articles held on the former drum, in order to stamp the article.

MURDOCH, J. *Improvements in breaks for railway and other carriages.* (A communication.) Dated Jan. 21, 1858. (No. 109.)

This relates to a patent granted to J. H. Clement, dated 17th Oct., 1855, No. 2318, and consists in a shoe being let drop upon the rim of a wheel, and at a very acute angle, and is drawn round during a portion of the rotation of the wheel, so as to grip it. Whilst thus being drawn round, it acts upon a strong spring, the reaction of which forcibly presses the shoe against the rim of the wheel. To limit the distance through which the shoe shall be drawn, a stop arrests it at a short distance above a line passing through the axes of the wheels. The object of this short distance is, that, when the sliding of the wheel ceases, the reaction of the spring may impart a retrograde movement to the wheel.

RAWLINS, E., and J. BRIDEN. *A new or improved method of working stamps used for stamping or raising metals and other such like purposes.* Dated Jan. 21, 1858. (No. 111.)

Here the ram is attached to a band which passes over a pulley, a continuous rotary motion being communicated to the pulley. The pulley is constructed as follows:—A series of holes are cut in

the periphery of the pulley, and in each of the holes a roller is situated. The rollers project from the periphery of the pulley, but, being supported upon springs, are capable of yielding and sinking to the surface of the pulley when pressed upon. When the band of the ram hangs loosely over the pulley, the pulley rotates under the band, without communicating motion to it, the rollers preventing the band from coming into such close contact with the pulley as is necessary to make the pulley "bite" and move the barrel. But when the workman pulls the loose end of the band the rollers are pressed upon, and, sinking into the pulley, the pulley immediately "bites" the band, and communicates motion to it, and raises the ram. When the ram has been raised to a sufficient height, the workman looses the band, when the rollers, no longer pressed upon, raise the band from off the pulley, and the ram falls. The workman has thus only to pull the loose end of the band to raise the hammer of the stamp, and to loose it and allow the hammer to fall.

Hermagis, H. *Improvements in stereoscopes.* Dated Jan. 21, 1858. (No. 115.)

These consist in adapting to the stereoscope, without the aid of any prism, spherical lenses, either simple or achromatic, having parallel spherical surfaces, compelling the eyes to be placed at a reasonable distance from the optical lenses, which allows of the view being more easily taken in by reason of its position towards the converging point of the luminous zones proper to produce the effect of relief in pictures placed in the stereoscope.

Raine, W. M. *Purifying and increasing the illuminating power of gas.* Dated Jan. 22, 1858. (No. 116.)

This consists in bringing gas into contact with a large surface of benzol or mineral naphtha, by passing it through chambers divided into different compartments, the upper one constituting a cistern for supplying the lower compartment. The gas enters the lower compartment, and travels from end to end in a zig-zag direction, over the surface of the liquid.

Haigh, W. B., and J. Cheetham. *Improvements in valves for steam engines, and in superheating the steam.* Dated Jan. 22, 1858. (No. 117.)

This consists, 1. Of an equilibrium throttle valve. Instead of making the underside of the valve square, or at right angles to the spindle on which it is placed, the inventors make it of a serpentine form, so that, as it rises, a small portion only of the circle is open for the steam to pass, the space gradually increasing as the valve moves onwards, thus affording an efficient mode of regulating the motion of the engine. 2. Of improved valves for working the engine. To the ordinary box valve they apply an internal valve to regulate the exhaust, so as to allow the steam to be cut off at any portion of the stroke by the working of the eccentric. And also for regulating the supply of steam they apply to the box, D, or other valve, an inclined equilibrium valve for cutting off steam at any portion of the stroke, the exhaust to be worked in the ordinary manner. 3. They pass the steam on its way to the cylinder through a heating apparatus for increasing its temperature and consequently elasticity.

Drouet, N. A., and P. P. Le Coq. *Improvements in treating chloride of sodium for obtaining therefrom certain useful products.* Dated Jan. 23, 1858. (No. 124.)

This consists in saturating a solution of chloride of sodium with ammonia, then passing through it a current of oxygen gas, either with or without previous addition of nitric acid, till crystallisation takes place. The crystals are to be used instead of nitrate of potash for manufacturing gunpowder, &c., or instead of chlorates for various purposes.

Vasserot, C. F. *A single and double-acting machine with electro-magnetic motive power.* (A communication.) Dated Jan. 23, 1858. (No. 125.)

This single-acting machine is composed of, 1. A fly-wheel mounted on a shaft. 2. A crank at one end of the said shaft. 3. A distributor fixed on the shaft. 4. An electro-magnet coated with thread. 5. Two attractive plates, placed one before and the other behind the magnets. 6. A connecting rod for the backward and forward motion serving for the two plates. On this rod three projecting rings are placed, one behind the lever to which the front plate is fixed, another at the distance required for the to and fro movement, and the third behind the second lever. 7. Two wire conductors; and, 8. A suspension rod for the plates. The double-acting machine is composed of two electro-magnets, one at each end of the machine, the fly-wheel being placed between them. A second crank is placed at the other end of the shaft. The backward motion in either machine is obtained by means of a set of distributors placed on the side of those which serves for the forward motion.

Samwells, J., C. H. Jones, and C. Pickard. *Improvements in blocking and shaping hats, bonnets, and other coverings for the head.* Dated Jan. 23, 1858. (No. 126.)

Here it is proposed to block and shape hats, &c., by the aid of moulds or blocks placed the one inside and the other outside the article, and of a shape corresponding to the desired form of the article when finished. One or both of these moulds or blocks are heated by the aid of steam, and pressure is applied thereto.

PROVISIONAL PROTECTIONS.

Dated July 28, 1858.

1697. A. Kellermann, of Courbevoie, France. The employ of new vegetal substances for dyeing, and especially to replace cochineal dye.

1699. M. Johnson, iron founder, of Sandbach, Cheshire. An improved rotary steam engine.

1701. J. Manton, of Birmingham, gun maker. A new or improved candlestick.

1703. W. E. Newton, of Chancery-lane. Improvements in gas meters. A communication.

1705. H. Harden, of Dundalk, Ireland, locomotive superintendent. Improvements in the construction of tubular steam boilers.

1707. E. A. Cowper, of Great George-st., Westminster. Improvements in generating power from steam, and in engines and apparatus for that purpose.

1709. J. Cliff, of Lambeth. Improvements in the manufacture of soap.

Dated July 29, 1858.

1711. J. Musgrave, of Belfast. Improvements in stalls and inclosures for horses, cows, and pigs.

1713. G. S. Parkinson, of Lambton-terrace, Kensington, gentleman. An improved connecting apparatus for working railway brakes, and effecting a communication between railway guards and drivers.

1715. J. L. Hinks, of Birmingham, manufacturer. Improvements in machines for cleaning knives, forks, spoons, and such other articles as are or may be cleaned by polishing, also in machines for sharpening knives.

Dated July 30, 1858.

1717. J. Luis, of Welbeck-st. A machine for cutting up almonds for the use of confectioners and others. A communication.

1719. J. Luis, of Welbeck-st. A new system of infusion apparatus. A communication.

1721. J. Spence, of Liverpool, iron merchant. An improvement in the manufacture of sheet, hoop, and nailrod iron.

1723. C. and F. Schiele, of Oldham, engineers. Certain improvements in "hydro-extractors," or centrifugal drying machines, and in the method of lubricating their bearings, which method is also applicable to other bearings where lubrication is required.

1725. T. Webb, of Tutbury, Derby, cotton spinner, and J. Craig, of the same place, manager. Improvements applicable to spinning, doubling, winding, and warping yarns or threads.

1727. J. H. Johnson, of Lincoln's-inn-fields. Improvements in candlesticks or holders for candles. A communication.

Dated July 31, 1858.

1729. J. S. Bailey, wool comber, of Keighley. Improvements in machinery for combing wool and other fibrous materials.

1731. W. Hartley, of Bury, Lancaster, engineer. Improvements in the arrangement of slide valves and side pipes or valve casings of steam engines.

1733. G. Ashcroft, engineer, and H. W. Wood, gentleman, both of Blackweir, Cardiff. An improvement in hydraulic machinery.

1735. J. Houston, of Nelson-sq., Blackfriars-road, gentleman. Improvements in the means of effecting the consumption of smoke in furnaces.

1737. H. Conybeare, of Abingdon-st., Westminster, civil engineer. Improvements in apparatuses for generating and super-heating steam and for producing the condensation of steam.

1739. E. J. M. Cetti, of Brook-st., mathematical instrument maker. An improvement in barometers, gauges, and other analogous instruments.

Dated August 2, 1858.

1741. E. Agneni, of Devonshire-st., Bloomsbury, painter. Increasing particularly the effect of decorative pictures, landscapes, drawings, and prints.

1743. G. S. Hill, of Ryde, Isle of Wight, miller. Improvements in hydro-pneumatic machinery.

1745. R. R. Jackson, of Blackburn, cotton spinner. Certain improvements in machinery or apparatus for sizing yarn.

1747. S. Hine, of Macclesfield, Chester, silk manufacturer. Certain improvements in machinery or apparatus for twisting, doubling, and retwisting and winding silk or other similar fibrous material.

1749. W. B. B. Harvey, of Brixton. Improvements in fly or screw presses.

1751. E. Heywood, of Liverpool, mechanic, and W. Heywood, of Manchester, warehouseman. Improvements in the construction of metallic pistons.

1753. M. Billing, of High Holborn. Improvements in metallic bedsteads and cots.

Dated August 3, 1858.

1755. G. Davies, of Serle-st., Lincoln's-inn. A process and apparatus for the extraction of oils for illuminating and lubricating purposes, and of carburetted hydrogen gas from the native bitumen of the West Indies. A communication.

1757. J. Shaw, of Manchester, machinist. A machine for the manufacture of pasteboard and cardboard.

1759. J. Steel, of Glasgow, brewer. Improvements in brewing and distilling.

1761. J. Kingsley, of Great Coram-st., lieutenant. Improvements in the construction of steam boilers.

1763. J. Greenwood, of Rawden, near Leeds. Improvements in the construction of steam boilers and other apparatus for heating water or superheating steam, which improvements are also applicable when heating air.

1765. C. De Jongh, of Lautenbach, France, manufacturer. Improvements in machinery for assorting and preparing for spinning silk and other fibrous substances.

Dated August 4, 1858.

1767. J. Spence, of Liverpool, iron merchant. An improved method of rolling sheets from puddled steel or steel iron.

1769. J. J. Russell, of Wednesbury, Stafford, iron tube manufacturer. Improvements in machinery for cutting and screwing the ends of tubes.

1771. J. Badcock, of Highgate. Improvements in apparatus to be applied to ladies' dresses and other articles of wearing apparel.

Dated August 5, 1858.

1775. L. Hall, of Bury, Lancaster, manufacturer. Certain improvements in looms for weaving.

1777. J. Luis, of Welbeck-st. A machine for pulverizing shell, horn, and whalebone. A communication.

1779. J. Luis, of Welbeck-st. A machine for drilling and grooving the naves of wheels, and also to force the axle box into the naves. A communication.

1781. E. Leigh, of Manchester, mechanical engineer. Improvements in machinery or apparatus for preparing and spinning flax, wool, silk-waste, or other fibrous materials.

1783. D. McCrummen, of Gourock, Renfrew, gentleman. Improvements in the manufacture or production of paper, which improvements are also applicable in the production of alkaline and other salts.

1785. R. A. Brooman, of 166, Fleet-st., patent agent. Improvements in knitting frames. A communication from U. Puech, of Paris.

1787. W. Clay, of Liverpool, iron manufacturer. Improvements in the construction of certain descriptions of bridges and girders.

1789. W. E. Newton, of Chancery-lane. An improved mode of ornamenting textile fabrics. A communication.

Dated August 6, 1858.

1791. G. H. Bovill, of Wimbledon. Improvements in the manufacture of gas, also in the manufacture of coke and other fuel.

1793. C. F. Kirkman, of Argyle-st., Regent-st., gentleman. An improved mode of treating sewage for agricultural uses, and for machinery to be employed therein.

Dated August 7, 1858.

1795. G. Weston, of Sheffield. A washing machine.

1797. J. Walker, of City-road, engineer. Improvements in the manufacture of electric telegraph cables.

1799. J. Smith, jun., of Coven, near Wolverhampton, engineer. Improvements in agricultural steam engines, and locomotive steam engines to be used on common roads.

1801. J. Luis, of Welbeck-st. A new covering, doubling, and twisting machine. A communication.

1803. J. Taylor, of Roupell-park. Improvements in the manufacture of blocks for the construction of sewers and drains.

1805. J. H. Johnson, of Lincoln's-inn-fields. Improvements in apparatus for working railway brakes. A communication.

Dated August 9, 1858.

1807. J. G. Picking and T. P. Pursglove, of Battersea. An improved pressure gauge for steam, gas, or other fluids.

1809. T. Ingram, of Bradford, York, foreman. Improvements in means or apparatus for operating railway brakes.

1811. W. Smith, of Dalston. An improved compound for coating or insulating electric telegraph wires, and for coating other surfaces.

1813. A. H. Williams, of Cornhill, manufacturer. Improvements in fastenings for porte-monnaies, pocket-books, and other like articles.

1815. W. E. Newton, of Chancery-lane. Im-

provements in machinery for drawing and twisting wool or other fibrous material. A communication.

Dated August 10, 1858.

1817. T. Pickford, of Mark-lane, merchant. Improvements in the preparation and manufacture of manure.

1819. M. Henry, of Fleet-st. Improvements in the manufacture or production of saltpetre, and the preparation of materials for the purpose. A communication.

1821. F. Haeck, of Schaerbeck, near Brussels, gentleman. Improvements in the construction of cocks, taps, or valves.

1823. J. H. Whitehead, of Saddleworth, woollen manufacturer. Improvements in the manufacture of woollen bags.

PATENT APPLIED FOR WITH COMPLETE SPECIFICATION.

1856. M. A. F. Mennons, of Paris. Improvements in the construction of Jacquard looms. A communication. Dated 14th day of August, 1858.

NOTICES OF INTENTION TO PROCEED.

(From the "London Gazette," August 24th, 1858.)

775. P. Brun. "Blowing fan." A communication.
776. J. Oxley. "Doors and sashes."
789. T. Kay. "Obtaining heat."
793. T. Spiller. "Stereoscopes."
795. T. T. Jopling. "Water-closets."
799. T. B. Ayshford. "Omnibuses."
801. R. Armstrong and J. Galloway. "Furnaces."
802. G. Pye, R. Smith, and B. Crossdale. "Looms."
803. W. C. Holmes and W. Hollinshead. "Metal castings."
817. L. Cowell. "Wire for corked bottles."
820. W. E. Newton. "Boots, shoes," &c. A communication.
821. J. Harris and T. Summerson. "Railway chairs."
822. A. H. A. Durant. "Husking seeds."
823. A. J. Boot. "Making labels."
826. G. G. Brown. "Ships' binnacles."
827. G. Walker. "Cleaning knives," &c.
834. J. Grassay. "Hangings."
837. D. Chalmers and J. T. Swallow. "Looms."
846. T. Luck. "Seeding land."
852. W. Bullough and J. Harrison. "Looms; weaver's healds."
867. D. Moore. "Fire-tongs."
888. H. A. de Saegher. "Preventing incrustation."
903. C. Lungley. "Ships and boats."
935. M. Sautter. "Diving bells." A communication.
946. W. Clark. "Railway crossings." A communication.
982. C. Schleicher. "Needles, pins," &c.
993. D. Thom and G. A. Phillips. "Oil and fat."
1005. J. S. Willway. "Ringing bells."
1026. W. E. Newton. "Fire-grates." A communication.
1035. W. E. Newton. "Circular saws." A communication.
1092. J. H. Johnson. "Artificial legs and feet." A communication.
1169. G. Alton and J. Fernie. "Steam boilers; plates for the same."
1179. J. Luis. "Paper, thread, tissues, and cordage." A communication.
1196. C. Clarke. "Dibbling wheat."
1198. S. Osler. "Making fish into guano and food."
1350. B. Pitt. "Knobs and roses."
1454. J. Morgan. "Spinning yarns."
1481. H. W. Wimshurst. "Sheet metal."
1548. F. Sang and T. W. Rammell. "Conveying letters and parcels."
1590. J. Rheinauer. "Bearings for axles," &c. A communication.
1598. A. H. J. Bastable. "Production of light." A communication.
1679. J. Taylor and J. Nimmo. "Healds."
1721. J. Spence. "Iron."
1729. J. S. Bailey. "Combing wool."
1764. A. V. Newton. "Forging nails." A communication.
1765. C. de Jongh. "Spinning silk."
1801. J. Luis. "Twisting machine." A communication.
1856. M. A. F. Mennons. "Jacquard looms." A communication.

The full Titles of the Patents in the above List can be ascertained by referring back to their numbers in the Lists of Provisional Protections previously published.

Opposition can be entered to the granting of a Patent to any of the parties in the above List who have given notice of their intention to proceed, within twenty-one days from the date of the Gazette in which the notice appears, by leaving at the Commissioners' office particulars in writing of the objection to the application.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

1882. F. Journeaux.	2013. J. G. Martien.
1907. V. Fouchier.	2021. G. Lowry.
1909. J. G. Martien.	2079. W. F. Thomas.
1912. W. Kidman.	2082. J. G. Martien.
1915. W. Wood.	

LIST OF SEALED PATENTS.

Sealed August 20th, 1858.

360. E. Borlase.	488. R. Roberts.
365. J. Petrie.	492. G. T. Bousfield.
371. R. F. Miller.	498. M. Smith.
374. J. Arnold.	501. T. T. Chellingworth.
375. J. B. Barnes and J. Loach.	513. S. Walker.
376. J. Templeman.	1181. G. Cheadle.
378. S. Middleton.	1258. J. F. Dickson.
382. J. Morison, sen., and J. Morison, jun.	1312. G. Castle.
388. J. Knott.	1318. T. Chatwin and C. Taylor.
446. J. H. Johnson.	1333. G. T. Bousfield.
458. J. W. Clare.	1357. J. Rubery and T. Warwick.
461. J. H. Johnson.	1359. G. T. Bousfield.
477. G. F. Harrington.	

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions.

LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

Dates of Registration.	Nos. in the Register.	Proprietors' Names.	Addresses.	Subjects of Design.
Aug. 2	4109	Bathgate and Wilson	Liverpool	Ventilator.
4	4110	B. Goodfellow	Chester	Boiler Flue.
7	4111	W. H. Atkinson	Tynemouth	Gas Meter.
18	4112	A. J. Clarke	Wolverhampton	Lamp.
,,	4113	W. Gillett	Hull	Hat.

PROVISIONAL REGISTRATIONS.

Aug. 12	1006	M. Gutknid	Noble-street, City	Fastening.
14	1007	P. Fenn and Co.	Friday-street, City	Parasol.

NOTICE TO CORRESPONDENTS.

Articles and Correspondence designed for insertion in the ensuing Numbers of the *Mechanics' Magazine* must reach the Office by the Tuesday of each week, at the latest. It is highly desirable that they should be forwarded earlier if possible.

CONTENTS OF THIS NUMBER.

LONDON: Printed and Published by Richard Archibald Brooman, of 166, Fleet-street, in the City of London. Sold by A. and W. Galignani, Rue Vivienne, Paris; Hodges and Smith, Dublin; W. C. Campbell and Co., Hamburgh.

Mechanics' Magazine.

No. 1830.] SATURDAY, SEPTEMBER 4, 1858. [PRICE 3D.

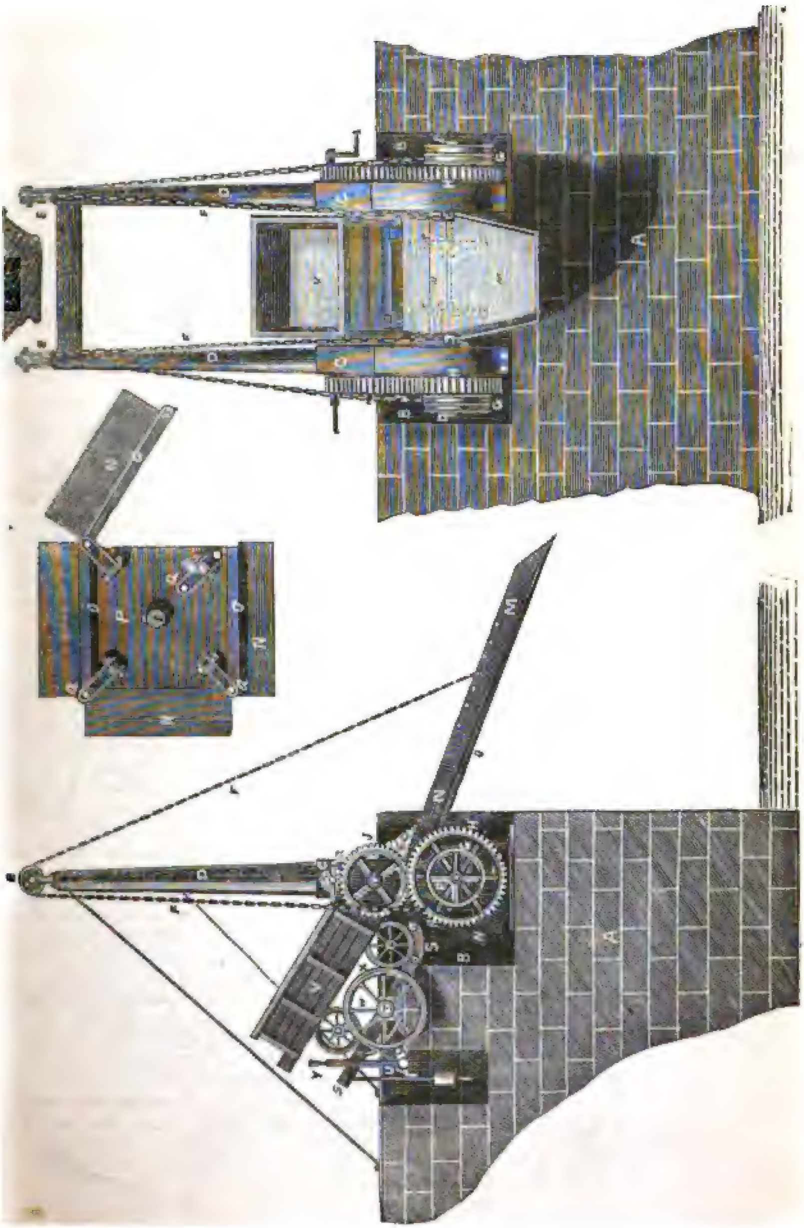
Edited by R. A. Brooman and E. J. Reed, 166, Fleet-street, London, E.C.

MARTIN'S PATENT MACHINERY FOR SHIPPING MINERALS IN TIDAL SITUATIONS.

Fig. 2.

Fig. 3.

Fig. 1.



MARTIN'S PATENT MACHINERY FOR SHIPPING MINERALS IN TIDAL SITUATIONS.

Mr. Robert Martin, the Superintendent of the General Terminus and Glasgow Harbour Railway, has patented an arrangement of machinery whereby coal and other minerals can be rapidly, economically, and conveniently shipped or transferred from the shore pier head into the holds of vessels lying in tidal ways. In shipping coal by the agency of this machinery the railway waggons are run up at right angles to the pier head or wall until they come upon a balanced tipping arrangement, consisting of a frame set on suitable centres, and fitted with counterweights and frictional brakes, so that when the waggon is run on to the frame up to the outer curved stops of the rails the coal is tipped out at once, the rate of descent being governed by the frictional brakes. As the coal falls from the waggon it descends upon the upper and landward end of an articulated shoot, which is so inclined as to direct it down into the hold of the vessel in the tidal way beneath. This shoot is of considerable length, and is in several pieces jointed together, and capable of being wound upon a square barrel or carrier, the shaft of which is set in end bearings in the pier head. The inner end of this shoot is fastened to the square barrel, each face of which is of the proper length for taking up the individual jointed lengths of the shoot, and suitable catches are provided for retaining the lengths in position as wound up. The barrel is actuated by winch handle or other gearing, and its shaft carries at each end a chain barrel or pulley, to which are attached supporting chains passed up and round overhead pulleys carried on suitable framing posts, and thence down for attachment to the extreme outer end of the shoot. In this way, by turning the barrel in either direction, the shoot is wound up or let down to suit the level of the water in the tidal way, and the apparatus is available for service in all states of the tide.

Fig. 1 of the engravings on the preceding page is an elevation or side view of one modification of the apparatus; fig. 2 is a front view, looking upon the machinery from the river side of the wharf; fig. 3 is an end view, showing a portion of the jointed shoot or delivering starthe and some of the details connected with it. The brick or stonework of the wharf, A, has built in it a rectangular recess, B, in which the main part of the machinery is fixed. Two massive cast-iron end standards, C, are bolted to the flooring of the recess, B; the upper parts of these standards form sockets, into which the lower ends of the wooden framing, D, are fitted. Each of the uprights of the framing, D, carries a grooved pulley, E, over which the hoisting chains, F, are passed; one extremity of each chain, F, is made fast to the grooved pulleys, G, which are with the spur wheels, H, keyed to the transverse shaft, I. The bearings of the shaft, I, are carried in the end standards, C, and the pulleys, G, and spur wheels, H, are arranged in close contiguity to each other immediately outside each standard. The spur wheels, H, are each in gear with an intermediate wheel, J, which is carried upon a stud fixed in the standard, C; these intermediate wheels are each in gear with a pinion, which is fast to the spindle on which the winch handles are keyed; the intermediate wheels, J, thus serve to bring the winch handles within convenient reach of the operating workman upon the wharf, A. The other or outer ends of the hoisting chains, E, are fastened to the outer portion, M, of a jointed or articulated shoot, which is made narrower towards its extremity. The remaining portion consists of a series of trough-like lengths of metal, N, which are bolted together so as to form a continuous but flexible spout or shoot. Upon the under side of the separate lengths of the shoot there are parallel ribs, O, which are made with an eye or eyes at each end. The extremities of the ribs are made so that the end of one rib passes between the forked or duplex end of the rib to which it is to be jointed. The separate lengths of the shoot are connected to each other by bolts and nuts; the outer end of each bolt extends beyond its retaining nut, for a purpose which will presently be referred to. The several lengths of the articulated shoot are wound upon metal centres, P, which are keyed to the shaft, I; these centres are square plates of metal. Near to each corner of the centres, P, is a lug, to which is secured by a bolt and nut a link, Q, that turns freely upon its centre. When the shaft, I, is put in motion by means of the winch handles, the inner lengths, N, of the shoot are wound upon the centres, P, and as each length is laid upon the centres the operator turns the link, Q, near to its outer end outwards, so as to pass over the projecting end of the bolt which passes through the ribs, O. By this means the several lengths, N, of the shoot are kept in position upon the centres, P, and prevented from falling away from their peripheries. When the lengths, N, of the shoot are unwound the links are thrown back as they pass in succession. The locking and releasing of the separate parts of the articulated shoot may also be effected by self-acting mechanical means, if desired.

When the water of the river or tidal way is sufficiently high the ship may be loaded,

using only the front portion, M, of the shoot for conveying the coal to the vessel, and one of the lengths, N, to receive the coal from the waggon. It is, however, to prevent the coal from being broken by falling through a greater height when the tidal way is low that the articulated shoot is designed, as when the shoot is unwound the incline is not rendered steeper, but simply extends further out, the extremity of the part, M, being so much lower in consequence of this extension; thus, when the water is low a greater length of the shoot is unwound, and as this is done the inner vertical edges of the parts come in contact with each other, and the several pieces form a horizontal plane. The angle of inclination given to this plane is determined by the length of the chains, E, which being adjusted in the first instance, the incline of the shoot remains the same, whether the minerals pass over the whole or a portion only of its surface; thus, at high water the vessel to be loaded may be close up to the wharf, whilst at low water she must be shifted outwards, so that the extremity of the shoot is over the hatchway. To prevent the shoot from altering its position after it has been arranged for the loading of a vessel, a pawl, R, is fitted to a stud fixed to the standard, C; the free end of the pawl falls into the teeth of the intermediate wheel, J, and prevents its recoil. In the rear of this mechanical arrangement for shooting the coal or mineral into the vessel is an apparatus for tilting the loaded waggons so as to discharge their contents on to the shoot. The loaded waggons are brought up upon rails or tramways in the usual manner to within a short distance of the framing, D, and the distance up to the framing is completed by means of a pair of moveable rails, S; these rails are long enough to admit of a waggon standing thereon; they are fast to a transverse shaft, T, which is carried in pedestal bearings that are bolted to the brick or stonework, A, of the wharf, the supporting columns of the masonry being built with a recess at the upper part to admit of the descent of the rails, S; the front extremities of the rails, S, are curved upwards, and at this part are connected to each other by a transverse tie bar; these upwardly curved ends each form a stop to check the further progress of the waggon. To each of the backward ends of the rails, S, a rod, U, is fitted, to which a counterweight is hung; the gravity of these weights is sufficient to bring the rails, S, and the waggon, V, back to their normal or horizontal position when the coals or minerals have been discharged therefrom. When the loaded waggon, V, is pushed on to the rails, S, its weight counterbalances the weights on the rods, U, which causes the rails, S, to turn upon their centre and tilt the end of the waggon over the shoot, N, thereby discharging the load upon the incline of the shoot, from whence it falls into the hold of the vessel. To prevent the too sudden descent of the waggon, V, the downward movement of the rails, S, is controlled by a brake, the action of which is regulated by the attendant. To one extremity of the shaft, T, a brake wheel, W, is keyed; to the periphery of this wheel is adapted the friction brake, X; one end of the brake is fast to a bell crank lever, Y, which is centred upon a stud which is fixed in a lug projecting upwards from the face of the base plate of this part of the machinery; the longer arm of the bell crank lever forms the controlling handle for regulating the pressure of the brake. When the loaded waggon is pushed on to the rails, S, the attendant by means of the handle on the lever, Y, tightens the brake, X, on the wheel, W, and causes the waggon to descend slowly and discharge its contents in an unbroken state upon the shoot, N. In this way coals or other minerals may be shipped with great ease and facility, and in a far better state than by the means heretofore employed for the purpose.

HEARDER'S PATENT TELEGRAPH CABLES.

The intelligent letter of our correspondent "P. M.," which appeared in our last Number, anticipated, to a certain extent, the publication of an invention which Mr. Hearder, the eminent electrician of Plymouth, has been for many months experimenting upon. Mr. Hearder having obtained provisional protection six months ago, and having then lodged at the Government Office a very able and elaborate specification of his invention, his patent right is not, of course, in the least degree affected by P. M.'s letter, or by any other steps which may have been taken, either in the way of publication or experiment, since February last.

Mr. Hearder, as we have before had occasion to notice, was the first to develope the extraordinary power of the induction coil in England; and his discoveries have not only been adopted and carried out in America and other parts of the world, but also by M. Ruhmkorff, of Paris, himself, to whom Mr. Hearder sent the particulars of the improvements which he had made upon the apparatus originally contrived by that ingenious philosopher.

As in the case of the induction coil the

improvements of this gentleman were effected by the judicious application of the simplest means, and a careful conformity to already well-defined electrical laws, so, in the present instance, the means which Mr. Hearder has adopted to overcome the almost single remaining difficulty attending the action of submarine cables, viz., the retarding influence of induction, are, to use the expression of an eminent telegraph engineer, "absurdly simple, whilst they are profoundly scientific." For our own part, we have rarely met with such a good example of the practical application of sound scientific reasoning, to meet a difficulty which threatens at present to cripple and circumscribe within narrow limits the operations of very extended submarine lines, and which, as in the case of the Atlantic telegraph cable, seems to increase in greater proportion than the length of the submerged conductor. Whilst it must be allowed that in this great undertaking mind and money have conjointly developed what may be fairly considered the latest if not the greatest wonder of the world, it must be remembered that it is one of the most important objects of the mind to economize the expenditure of money, which, after all, in connection with telegraphs, is the representative of labour; and the man who can construct a telegraph cable which may cost a quarter of a million of money, so as to transmit two letters or even a letter and a half where only one was transmitted before, confers no small boon on society. That such would be the result of the patentee's invention he confidently expects; and, if he brings the same scientific knowledge to bear in the determination of the suitable size of his conductor, we can see no reason why he may not be able to transmit five or even ten letters in the place of one.

Whilst, however, the patentee makes the removal of the mischievous results of induction the chief merit of his invention, there appear to us other features collaterally and almost inseparably connected with the construction of his cable which are scarcely less important, and the value of which will be immediately recognized by the telegraph engineer. Daily experience is pointing out the necessity of adopting cables in which strength shall be combined with lightness, and we know of no form of cable which affords greater facilities for the combination of these two elements than the form now patented by Mr. Hearder. His cable appears capable of being made of any specific gravity, of any degree of strength relatively to its weight, of any amount of conductive power, and, in addition to these advantages, it claims the crowning one of transmitting messages with greater rapidity by obviating the effects of induction. Since Mr. Hearder's process of insulation does not necessarily involve the employment of any one specific form of conductor, the future adoption of it may be a matter worthy of the serious consideration of other patentees, and we cordially wish the patentee the success which his energy and talent eminently entitle him to. One thing is certain, viz., that, should it not realize all that the patentee confidently expects in a scientific and electrical point of view, it is a grand step in advance when considered merely in relation to the mechanical construction of the cable.

As nothing can be more clear and correct than Mr. Hearder's own description of his invention, we shall adopt it in giving the following account of it.

The invention consists of an improved mode of insulating telegraphic wires for submarine purposes, so as to lessen the inductive action usually known as a statical charge of the surfaces of the insulating sheath or covering, after the manner of a Leyden jar, which action now interferes with the operation of the simple dynamic electric current. He effects this in the following manner:—First, he covers the conductor with cotton, silk, wool, hair, flax, or other fibrous or porous substance or substances, in any of their forms, in one or more layers, previously to coating it with the insulating material, which material may be india rubber, gutta percha, or any of their compounds, or any other insulating composition; or, secondly, he coats the wire with the insulating material, and then applies any of the before-mentioned porous or fibrous substances over the insulating coat, and covers the whole again with the insulating material, and, if necessary, puts on additional alternate layers of fibrous and insulating material; or, thirdly, coats the conductor with the fibrous, porous, or textile materials in the manner described in the first process, and then applies the alternations of insulating and fibrous materials in the manner described in the second process.

The porous, fibrous, or textile material with which the conductor is covered, or which is inserted between the layers of the insulating medium, is better for having its porosity preserved as much as possible consistently with the required strength of the cable.

The precise mode of laying on the fibrous materials may vary according to circumstances, but he prefers to lay them on when used in the form of threads or strands in a long spiral direction; and, when more than one layer is used, each layer is better for

being put on in the direction opposite to the former one; or, where economy is not a great object, they may be braided on. When in the form of tapes or strips, they may either be wrapped spirally round, or laid longitudinally along the insulated or uninsulated wire, and folded round it; the latter mode being preferable, as it gives greater strength. In all cases, he recommends the employment of a soft, adhesive insulating medium, which shall adhere to the fibrous material as well as to the surface of the more solid insulating substance used for the several coatings in order to prevent the layers from sliding over each other. He does not, however, confine himself to any of these plans, but merely recommends them as among the best modes of combining the porous or fibrous substances with the insulated material.

As telegraph cables are usually constructed, the gutta percha or other insulating substance which encloses the conductor acts the part of a Leyden jar, the internal conductor serving as the inner coating, and the water as the outer coating; and his object is to interpose a fibrous or porous substance between the wire and the insulating coating, in order to prevent the contact of the metal with the homogeneous surface of the insulating medium; and, for a similar reason, he also puts on the outer layer or layers of porous and insulating materials, viz., to prevent the water, or other external conductor, from coming in contact with and forming an external coating to the insulating sheath, which more immediately includes the conductor.

Where two or more conductors are to be embodied in the same cable, he takes the requisite number of conductors prepared in any of the ways aforesaid, and either binds them together with the porous materials before described, and then covers them with insulating medium, or unites and covers them with insulating medium at once; or he applies the porous, fibrous, or textile material and the insulating medium over the whole, when thus united, in alternate layers, as before described.

"I am aware," says Mr. Hearder, "that patents have been taken out, and contrivances have been adopted, for employing fibrous or textile substances in conjunction with insulating materials, but they have been applied for different purposes, viz., wires have been coated with fibrous substances in order to effect the adhesion of insulating materials which would not adhere sufficiently to the wire without them. Or, fibrous substances have been incorporated with insulating materials so as to bind them together, and to give solidity, strength, and tenacity to substances which could not be used without them. Now, although the introduction of my fibrous layers may add to the strength of the cable, yet my object is different, for I use them, as before mentioned, for the purpose of keeping the surfaces of the insulating medium from contact either with the internal conductor on the one hand, or the water on the other; and the invention is founded upon the following principle:—

"The effect of the discharge of a Leyden jar, or coated glass plate, of given size, will depend, first, upon the thinness of the glass, and the consequent proximity of the opposed coatings to each other, and, secondly, upon the complete contact of these coatings with the glass surface. If paper, cloth, silk, or any other porous substance, be inserted between the glass and either or both of its tinfoil coatings, the electrical effects of the discharge from such a jar or plate are trifling when compared with those produced by one not so prepared. This effect is not simply due to the increased distance of the coatings from each other, but to the interference of the interposed fibrous substances with the electrical conditions of the jar, for a jar or plate whose thickness of glass shall be equivalent to the united thickness of the glass and fibrous coatings of another jar or plate of similar size, and whose coatings are consequently at as great a distance from each other, will produce a greater effect in discharge than one having fibrous substances between the tinfoil coatings and the glass.

"As an ordinary submarine telegraph then represents an extended Leyden jar of enormous dimensions, a very minute charge over the surfaces of which produces great disturbing influences, it is of the highest importance to adopt means to reduce these mischievous actions as much as possible.

"By inserting a fibrous material between the surface of the conductor and the inner surface of the insulating sheath, I prevent that perfect contact of the two surfaces which is absolutely necessary for the full effect of the statical charge or discharge. So also, by interposing a layer of fibrous substance between the outer surface of the non-conductor and the water, and protecting this again by a waterproof sheath, I further prevent the water from acting as a coating to the outside of the sheath, which may be in any way induced upon, or charged inductively, by the current of the internal conducting wire, thereby breaking up, to a very great extent, the conditions of the Leyden arrangement as before described, and thus diminishing the effects of any residual charge which may be taken up by the insulating sheath."

The efficiency of the arrangement may be still further increased by a second or

third alternation of fibrous material and insulating coating. As, however, the effect of the external fibrous coating is greater than that resulting from the internal one, the latter may be occasionally dispensed with, especially where more than one external alternation is employed. Any cable constructed upon this principle may, for the sake of additional protection from injury, be covered with yarn, wire, or any other protecting substance, if required.

HARBOURS OF REFUGE.

(Concluded from page 198.)

Third. — The North-East Coast of England.

It appears in the evidence taken by the Committee, that between St. Abbs' Head and Flamborough Head, a distance of about 150 miles, every harbour along the coast, without any exception, has a bar at its entrance, more or less dangerous, and that none of them can be entered at low water. This coast includes the important ports of the Tyne, the Wear, and the Tees, besides those of Berwick-upon-Tweed, Blythe, Hartlepool, Seaham, Whitby, and Scarborough. Having reference to the great and rapidly increasing traffic to and from the ports included in this line of coast, and to the number of casualties upon it, the Committee express their opinion that this portion of the coast urgently demands the earliest consideration, with a view to lessen the enormous loss of life and property which annually occurs upon it, a great mass of which, as Mr. Calver has stated, arises simply from the want of a harbour of refuge in times of emergency. Captain Sulivan has shown that the entire tonnage of British sailing vessels annually clearing coastways from ports in England was 8,162,000 tons, and coastways and foreign, 15,796,000 tons; and that, of these quantities, the tonnage from the five ports of Newcastle, Hartlepool, Sunderland with Seaham, Shields, and Stockton, clearing coastways, was 3,733,000 tons, and coastways and foreign together, 5,160,000 tons; so that the tonnage of these five ports represents fully 45 per cent. of the whole coasting trade of England, and fully 32 per cent. of the entire trade, coasting and foreign together. With regard to wrecks, Captain Washington states, that he has computed that one half of the whole occur on the east coast of Great Britain, and fully one half of that number between the Frith of Forth and the Humber; this would represent at least 25 per cent. of all the wrecks on the coasts of the United Kingdom as occurring within that limit. Great and praiseworthy efforts have been and are being made to improve the approaches to some of the existing harbours on that coast, and especially at the mouth of the Tyne; but these are works more applicable to the special purposes of the ports in connexion with them, than to a general harbour of refuge so much required. With a view to such a work, Captain Washington says, "Tees Bay is the focus of wrecks on the east coast of England, and this bay includes Hartlepool, Stockton, and Redcar;" and he has no doubt that some part of Tees Bay is the best spot for such a national work. But, while his impression is in favour of Hartlepool, which has been reported upon to the Admiralty by the late Mr. Rendel, yet it would require further consideration whether Hartlepool or Redcar, or which side of the bay, should be adopted. Captain Vetch and Mr. Calver both concur in his recommendation of Tees Bay as the best locality, and of Hartlepool as the most eligible spot. The only other point of this coast which has been much urged upon the Committee as suitable for a harbour of refuge, as distinguished from the local requirements of individual ports, is Filey Bay, about half-way between Flamborough Head and Scarborough; and the arguments and facts put forward by Mr. Coode as an engineer, and by mariners who have long navigated that coast, are well worthy of being carefully considered before any final decision is arrived at upon the subject. But, whatever point may be decided upon competent authority as the best, a harbour of refuge on this part of the coast, of dimensions suitable to its large rapidly increasing traffic, is urgently required.

Fourth.—The Coasts of Ireland and the Isle of Man.

The chief points on the coast of Ireland to which attention has been directed with a view to afford shelter for vessels in distress are Carlingford Bay, the Skerries, near Portrush, Waterford, and Wexford, though the latter partakes more exclusively of the character of a private trade harbour. In these places there are already natural harbours, only requiring some improvements in order to render them more available as harbours of refuge for passing ships. With respect to Carlingford Bay, Captain Washington is of opinion that an outlay of £20,000, to be expended in the removal of a bar, would make it "an admirable harbour of refuge, which would supply all the serious want that is now experienced on the coast between Belfast Lough and Dublin Bay;" and engineers, as well as practical mariners sailing from Liverpool, have given evidence of the most important character as to the great advantages which the foreign trade from Liverpool to Ame-

rica and other places would derive from a harbour at that point. Waterford is similarly circumstanced. Captain Washington states, that "there are no two spots in the whole of the United Kingdom at which good harbours of refuge could be got at so small an outlay as at Waterford and Carlingford; £20,000 laid out on each of those would render them available at all times for the greater part of the vessels that navigate the Irish seas." These would especially include the whole of the foreign trade to and from Liverpool, as well as all the other ports on the west coast of England. The Committee express themselves in favour of these particular works. With regard to Wexford, they are not prepared to speak with so much confidence. It appears that it would be available only at tide-time, and then only for vessels of a light draught of water; and also that the sands with which the harbour is beset at the mouth are constantly shifting, so as to change the character of the channel. With regard to the Skerries, Portrush, on the north coast, the circumstances are very peculiar. There is at present a large bay to the eastward of which a high headland stretches northward, so as to form a protection from the east and south-east. From the western side of the bay a chain of rocks, called the Skerries, stretches from the land in the form of a segment of a circle towards the north-east, but with considerable openings at intervals. The prevailing wind on that coast which is most dangerous to the navigation is from the north-west, against which the Skerries form at present a partial protection; and, if the interstices in the chain already referred to were filled up, the protection would be perfect, and a harbour of the finest and most secure character would be formed, easily entered at all times, and without risk of detention as soon as the weather moderated. The facilities for making a first-class harbour of refuge at this point are ably and clearly pointed out by Sir John Burgoyne, Sir James Dombrain, and other witnesses; and Mr. Dargan, the eminent contractor, stated to the Committee that the whole might be accomplished for a sum of £100,000. Two witnesses who have been in the habit of sailing from the Clyde and Liverpool to America gave evidence as to the great importance which a harbour of such a kind would be on the north coast of Ireland, when from the state of the winds it was desirable to go or come north about; and it appeared that the existence of such a harbour would induce ships to adopt that route much more frequently than they now do, thus relieving to that extent the overcrowded channel round the south of Ireland. The Committee are of opinion that this is a work well worthy of favourable consideration. With regard to the Isle of Man, Captain Washington speaks of it as "the beacon of the Irish sea," and is of opinion that a small harbour of refuge is required to be constructed outside the present tidal harbour of Douglas. Captain Vetch has stated to the Committee that he has already, at the request of the Admiralty, designed a pier in that situation, and for the purpose named, which would be available for shelter for vessels passing through those seas, as well as a protection to the large herring fleet frequenting that island; at the same time, the Committee think it right to state that their attention has been called to Port Erin as a suitable place for a harbour of refuge.

The various works which the Committee have thus enumerated as being needful purely or mainly for harbours of refuge, and which appear to them to be of a character which can only be executed as national public works, and, as such, under the direction and control of the Government, are:—1. A harbour of refuge on the north-east coast of Scotland, estimated to cost from £80,000 to £335,000, according to the site that may be selected. 2. A harbour of refuge on the north-east coast of England, at an estimated cost of from £800,000 to £860,000. 3. An extension of the present harbour at St. Ives, at a cost of £174,000, or, if Padstow is adopted, at a cost not exceeding £35,000. 4. A harbour of refuge at the Mumbles, or at some place in the Bristol Channel, at a cost of £300,000. 5. An improvement of the harbour at Carlingford, at a cost of £20,000. 6. An improvement of the harbour at Waterford, at a cost of £20,000. 7. The construction of a harbour of refuge at the Skerries, Portrush, at a cost of £100,000. 8. A pier in the Isle of Man, at a cost of £40,000; making a total not exceeding the sum of £2,000,000; or, if spread over a period of 10 years, at the rate of £200,000 a year.

The Committee have not, in the most important instances where harbours of refuge are now recommended, ventured to determine the particular spots upon which they should be constructed. The various grounds upon which the merits of these different places rest are of a nature necessarily so technical in their character, involving questions of engineering and of nautical skill, as well as matters of fact as to the facilities which the different spots offer for construction by the supply of material and other considerations, that it appeared to them that they could only be satisfactorily determined by a Royal Commission; and such a Commission

has since been appointed, consisting of Rear-Admiral James Hope, C.B.; Major-General Sir J. M. Frederick Smith; W. S. Lindsay, Esq.; Captain J. Washington, R.N., Hydrographer of the Admiralty; Captain Bartholomew J. Sulivan, R.N., C.B.; Captain J. Vetch, R.E.; and J. Coode, Esq.

The Committee then proceed to consider the evidence taken upon the important financial questions which have arisen in the course of the inquiry as essentially connected with the subject. The estimated cost of the proposed improvements has already been stated as not exceeding £2,000,000; or, if spread over ten years, at the rate of £200,000 a year. The Committee consider that any expenditure the effect of which shall be to prevent or mitigate the losses which result from the want of the proposed works, may fairly be regarded, in a national point of view, as an investment the value of which is to be judged by the amount of the national saving effected thereby. Regarded from this point of view, and supposing that the important works now suggested were to prevent a loss of property only to the extent of thirty per cent., the whole outlay required would be defrayed by less than four years' saving effected by it. With regard to the saving of life,—a question which, in public importance, and as involving the necessity of action on the part of Parliament, must be looked upon as one of much greater moment,—the Committee remark, that the proposed works would in all probability be the means of saving a larger proportion than in the case of property. The loss of life is generally the result of total wrecks, and it is that class of casualties that would be most avoided by harbours of refuge.

After a very fair and careful examination of the financial part of the question, the Committee recommend that the harbours of refuge shall be maintained partly by a toll levied upon passing shipping. In considering, however, the amount of the charge which may fairly be imposed upon shipping for the construction and maintenance of these harbours, they are of opinion that there are plain grounds upon which shipowners should not be called upon to defray the whole. In some respects the utility of such harbours would be of a character for which the public revenues of the country might fairly be called upon to contribute; for example, all the works recommended would be less or more useful for vessels of the Royal Navy taking shelter, and as coaling stations for ships of war, there being at present no harbour between Flamborough Head and the Fern Islands where such a vessel can coal; they would also be useful as national defences, the fixed breakwaters affording great facilities for the erection of powerful batteries. Again, the effort to save life may fairly be classed as a national object. For these reasons the Committee are of opinion that any such charge upon shipping should be placed at an extremely moderate amount, even though the revenue derived from it did not reach the sum required for the purposes indicated.

They conclude, that such a charge, if imposed, should not exceed in any case one penny per ton upon all ships entering into, or clearing from, ports in the United Kingdom, which ships, in the ordinary course of their voyages, would pass the harbours to be constructed; and that, whatever rate is fixed upon at first, it shall be reduced from time to time, so as not to exceed a total sum, which shall be equivalent to three-fourths of the interest, which should be computed at the rate of three per cent., and of the cost of maintenance.

With regard to the best mode of construction for harbours in deep waters, the Committee have taken some evidence. There are three modes at present in use: the first may be termed Mr. Rendel's plan, which has been so successfully adopted at Holyhead and at Portland; the second, which is a modification of the first, is one recommended by Mr. Abernethy, and upon which he has constructed a harbour at Blythe; and the third is the plan of building walls of masonry by means of the diving bell, as in use at Dover. The first and third of these plans will be found to be described in great detail in the evidence given by Mr. Coode, the engineer in charge of the works at Portland; the second plan will be found to be described in the evidence of Mr. Abernethy. A fourth plan of constructing breakwaters was submitted to the Committee by Mr. Hayes. No breakwater has been constructed upon this plan in this country, but it is stated that it is being adopted at Melbourne, in Australia. With regard to the constructions proposed in this report, the Committee are disposed to view favourably the plan invented by Mr. Rendel, as used at Holyhead, or as modified by Mr. Abernethy—first, because it is much the cheapest; second, because works can be accomplished in that way much more speedily than in any other; and thirdly, because in all the cases referred to there is abundance of material upon the spot to make that plan practicable.

THE ATLANTIC TELEGRAPH.

The citizens of the United States are indulging in an extraordinary amount of exultation at the success which has attended the laying of the Atlantic cable. Of this we cannot of course complain; but unfortunately they are very selfish in their rejoicings, and indisposed to do justice to our countrymen in the matter. Mr. Cyrus W. Field and Captain Hudson are bepraised by them almost to the exclusion of those English gentlemen — Mr. Charles Tilston Bright, Captain Preedy, and others—who so ably and gallantly shared in the difficulties and perils of the enterprise. Now the truth is, that we are indebted for the final success of the undertaking to the first of these gentlemen, Mr. Bright, much more than to any other individual, as those who are most intimately acquainted with the details of the last expedition are fully aware; and it is with much pleasure that we are able to state that an intimation of Her Majesty's intention to confer the honour of knighthood upon Mr. Bright and Captain Preedy has reached us. This permanent testimonial of Her Majesty's intelligent interest in the late gigantic undertaking will very fitly commemorate its success, and will be gladly approved by the country.

The *Times* is almost maliciously angry with the selfish displays of the Americans. People here, it says, begin to rub their eyes and wonder if English science, English money, and Englishmen really did conceive and carry out to a successful issue the whole plan of the Atlantic cable from beginning to end. Under such circumstances it may be well to state at once that the idea of the submarine telegraph between England and America was started here and worked out here, formed into a practical plan, and into a company. By this company the money was raised almost entirely in England; in fact, all the shares held in America from first to last are scarcely more than half the number taken up in Liverpool in one week alone. The cable has been made in England, English engineers devised and constructed the paying-out machines at the works of Easton and Amos, English electricians planned and ascertained by practical experience the best means of working through the wire. All the ships of the expedition, except the *Niagara* and *Susquehanna* last year, and the *Niagara* this year, were provided by the English Government, and both on board the *Agamemnon* and *Niagara* English electricians and English engineers were alone employed to submerge the cable; in fact, to accomplish the undertaking.

It is generally the fate of those who grasp at inordinate quantities to have even the small share which would otherwise be given to them withheld. This rule is likely to apply in the case of the officers of the *Niagara*, and if they put in a claim to be considered foremost among the agents in this great scheme they must expect to hear of things which, in the general satisfaction on this side of the water, would otherwise have been forgiven, if not forgotten. They will be told how the rough, and, to say the very least of it, the careless manner in which they threw out the rope from the *Niagara* at Keyham, after the first failure, was nearly destroying that half, and it, in fact, did destroy very many miles of it. They will be told, also, how, even in the last trips, even the character of "guest" did not suffice to protect the English gentlemen and workmen on board their ship from such annoyance and insult that it was feared that when the vessel joined at the rendezvous the English on board the *Niagara* would refuse to proceed any further in her, and so put a stop for a time to the whole scheme. In fact, it was only through the influence of Mr. Canning on board the *Agamemnon* that such a strike, if we may so call it, among the men was prevented before the vessels left Plymouth. Captain Hudson and his officers will also be reminded how when the ships returned to Queenstown after the great storm, they were almost to a man against further attempts. If these officers deserve a public recognition at all, what do not the real working men of the *Agamemnon* — Mr. Bright, Professor Thompson, Mr. Canning, and Mr. Clifford—deserve?

On Monday last, Mr. Clifford started first for Valentia, and next for Newfoundland, with the shore ends of the Atlantic cable. These ropes are exceedingly massive, weighing upwards of six tons to the mile; and when these have been carefully spliced and added on the Atlantic telegraph will be complete, and we trust remain so for years to come. About five or six miles of the shore end at Valentia were laid last year, and this length has been buoyed, so that Mr. Clifford will only have to grapple for it and to make the splice with the rest. Submerging the portion at Newfoundland will require more care and a judicious choice of position, but such cables in such shallow waters can neither be lost nor broken, and in the care of such an engineer as Mr. Clifford they run little risk of either.

POTTER'S PATENT WINDING-ON MACHINE.

The jury could not agree upon a verdict in the trial respecting this patent (reported in our last Number), and the case will therefore be re-tried, in London.

NEW SUBMARINE TELEGRAPH CABLES.

The *Times* of Saturday last, in an article elsewhere referred to, gives the following account of new submarine telegraphic cables.

In a short time Mr. Canning, we believe, will have to start with the great cable which is now being made at Glass and Elliott's, and which is to be laid down for the Electric and International Telegraph Company between this country and the Hague. This is the largest and heaviest cable that has ever been yet manufactured, and it is not too much to say that no other makers, besides Glass and Elliott, in the world could produce a wire so massive, and yet so finely and perfectly finished. Up to the present time the electrical communications between this country and the Hague have been maintained nominally by four light ropes, each containing one copper conductor, and each covered with solid iron wire. We say nominally by four ropes, though really it has rarely been by more than two, as, from the shallowness of the water between Lowestoft and Holland, some one or more were always being injured by vessels' anchors, so that it was constantly necessary to keep a steamer employed to pick them up, mend them, and lay them down again. To put an end once and for all to these perpetual sources of outlay, the company have determined on the present monster rope, combining the four wires in one and otherwise of such strength and weight that if a vessel is so unfortunate as to catch her anchor in it she will infallibly lose it, as beyond a doubt she can neither raise nor break this cable. It is composed of an inner rope of four separately insulated No. 13 copper wires, each cased in its own gutta percha, and the four twisted, with hemp between the interstices, into a rope. This is bound round by six large strands of greased hemp, and the whole enclosed with 10 iron wires which have no number in the trade, for each in fact is a small iron-rod, being no less than 1½ inch in circumference. The weight of the whole cable is nearly 10 tons per mile, and its breaking strain is upwards of 100 tons. The length made is 140 miles; the distance between the points of landing—Dunwich, near Lowestoft, and Zandvoort, about 30 miles from the Hague—is about 98 or 100 miles. Nearly 50 per cent., therefore, is allowed for slack, a large margin considering the immense strength of the cable, and that the vessel may put any strain on it she pleases. The paying-out machines to be used on this occasion are simply double drums of great weight and strength, with friction clutches of equal power to the size and weight of the drums. This machine was used with the first Mediterranean cable, and for the cable laid by Mr. Canning across the Gulf of St. Lawrence.

At Glass and Elliott's works two other cables are also in progress, one for the Submarine Company, about 300 miles long, between Cromer, in Norfolk, and Emden, in Hanover, and another for the same company to Denmark, near Cuxhaven, a distance of 380 miles. Both these cables will be heavy, as becomes the places they have to work across.

ALGER'S PATENT FURNACE COMPANY.

A prospectus has recently been issued of a new company designed to bring into operation Alger's patent for "an improved furnace for smelting iron,"* by which, to use the words of the prospectus, "the capacity of the furnace can be materially increased, in a manner suitable to the production of good iron, without a corresponding increase in the pressure of the blast." Indeed, it is alleged that, by a modification in the working apparatus, and by changing the form of the interior, a furnace can be constructed of twofold or threefold size, with a power of production greater than could be derived from the same quantity of fuel and ore if worked in two or three smaller furnaces. "Of course," says the *Railway Gazette*, "it is unnecessary to say that, if this is really so, the invention is one of the most valuable which has been brought before the notice of the ironmaster for the last hundred years; and, that the statements of the promoters are entitled to the most emphatic reliance, we need only point attention to the fact that Mr. George Simpson, the deputy chairman of the Institution of Civil Engineers; Mr. Biddulph, Mr. Blackwell, Captain Galton, of the Railway Department of the Board of Trade, and Mr. Nicholson, of Farnham, constitute the Board of Directors of the Company, which is now before the public for the purpose of getting a subscribed capital, to purchase and to work the patent. At the late annual meeting of the South Wales Institute of Civil Engineers, the subject of this furnace, and of the economy effected by its use, was brought before the notice of scientific and practical men assembled; and it has created no little stir in that busy hive of the iron industry. The basis upon which the present company is formed, is to grant licences for the use of the patent, taking a royalty upon the tons of pig iron made, upon a scale which bears but a

* Dated 13th Oct., 1857. (No. 2614.)

small proportion to the saving to be effected. The principles of the furnace have, it appears, been applied in the state of New York to cupola furnaces for smelting large quantities of pig iron in a short time, and the furnaces of the old form are being dispensed with. The capital worked is £100,000 in £50 shares, with a deposit of £2 per share. The patent is one the successful working of which very reasonably creates much excitement amongst the manufacturers of iron. If triumphant, a new era of prosperity dawns upon us."

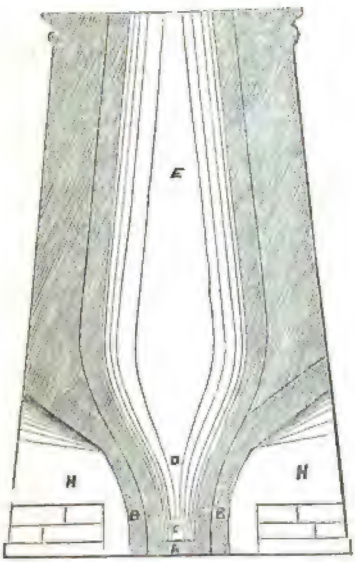
In order that our readers may be in possession of the exact nature of the very simple invention respecting which our contemporary speaks thus warmly, we place the following description of it, by the inventor himself (Mr. Charles Coffey Alger, of Newburgh, Orange, State of New York), before them. We fear there is scarcely ground for anticipation of any very extravagant results springing from it, although it is difficult to form a very decided opinion respecting it without experiments. Mr. Alger writes:—

"Blast furnaces for smelting iron ores have always been constructed of a square, polygonal, or circular form in their horizontal sections through either the hearth or crucible, and, as it is necessary to the proper working of a furnace that the blast of air should penetrate the whole charge equally, experience has demonstrated that with heavy coal, such as anthracite, a diameter of about five feet in the hearth is the maximum limit of capacity for the proper working of such furnace in order to make good iron. Even with that capacity a blast from four to five pounds pressure to the square inch (such depending on the quality of the coal) is necessary, the great weight of this coal admitting of such pressure. But with lighter fuel, such as charcoal, bituminous coal, and coke, which is easily lifted, and the fine particles forced up the blast and lodged in the boshes, and which therefore does not admit of a blast of such heavy pressure, the furnace cannot advantageously be made so large as five feet in width or diameter of hearth; and with the proportions indicated the use of a blast of heavy pressure is attended with serious inconvenience on account of the expansion which the air undergoes in the cavities or openings of the charge, as such occasions inequality in the distribution of the body of air. The main objection, however, arises not only from the great cost of machinery and power to produce and maintain a uniform blast under such heavy pressure, but from an increased consumption of fuel, all of which adds greatly to the cost of erecting and running furnaces under such conditions. It is the general belief of intelligent and practical ironmasters that the relative proportions of the hearth to the boshes should be about as one to three, and that the diameter of the hearth should not much exceed five feet, to work with economy and produce the best quality of iron. The product cannot be increased with economy by increasing the diameter or width of the hearth much beyond five feet, because that necessitates at times a still greater increase of pressure beyond five pounds, and such increase of pressure would not only be attended with a still greater proportional consumption of fuel, but besides it is liable to injure the quality of the iron, causing all that which is melted at or near the tuyeres to be hard, however well the materials may be prepared. Besides this difficulty, a blast of over five pounds pressure is liable to injure the strength of the iron. And, if the hearth or crucible is increased in diameter or width much beyond five feet, whenever the furnace loses its required heat, which often occurs, a hard mass is liable to form on or about the middle or back wall of the hearth below the tuyeres, to the great detriment of the smelting process. These masses, when once formed, remain for a great length of time after the furnace is brought back to the temperature required for making good iron. For the reasons above stated, it has been universally recognized that there is a practical limit to the capacity of such furnaces, and, although it has long been known that it would be a source of great economy if the capacity of furnaces could be materially increased in some way suitable to the production of good iron, with the blast not exceeding the pressure usually employed, yet prior to my invention no plan, to my knowledge, has been produced which would accomplish the desideratum. The object of my invention has been to produce a furnace for smelting iron, and having a capacity materially increased beyond that of furnaces as heretofore constructed, and at the same time preserving what are recognized as the proper relations of the blast to the charge. And to this end my invention consists in making the furnace of an elliptical or oblong form in the planes of its horizontal sections, from and including the hearth or crucible upwards, and having two mouths (one at each end of the hearth), and one or more ranges of two or more tuyeres in each of the two opposite sides, so as to introduce the blast in the direction of the breadth of the hearth.

"In the accompanying engravings, A represents the hearth or crucible, which is of an elliptical or oblong form in the plane

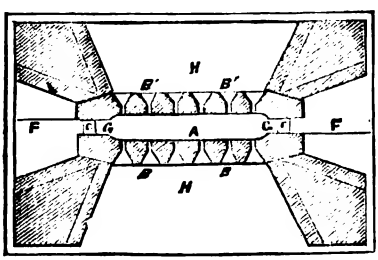
of its horizontal section, but in all other respects formed in the usual manner; B, B are two series of tuyere arches or openings, one on each side, and arranged between the main working arches, H, H. To these tuyere arches are fitted tuyeres and blast pipes, in the usual manner, in order to introduce the blasts in the direction of the breadth of the hearth. C, C are the dam stones, D, D the boshes, and E the stack, bearing the same proportions to the hearth, so far as width is concerned, that they do in furnaces of the usual form; F, F are arches, one at each end of the working mouths, G, G. I contemplate, in some instances, employing two ranges of tuyeres,

TRANSVERSE SECTION.



one above the other. H, H are main arches, leading by B, B to smaller or tuyere arches. The boshes as well as the stack are of an elliptical form, and in all

HORIZONTAL SECTION.



other respects bear the same relations in form to the hearth that they do in furnaces of the usual construction. The breadth of the hearth is to be determined by the kind of fuel and the pressure of the blast, with a view to the quality of the iron to be produced and economy of fuel, the length of hearth being due to the quantity of iron which it may be desirable to smelt within a given time.

"It will be seen from the above that on my improved plan the capacity of the furnace can be materially increased without changing the relations of the blast to the charge, a result which cannot be obtained, as I believe, by any other known method, thus inducing economy, as it is well known that the greater the quantity of ore and fuel which can be in preparation and reduction at one time, the less will be the relative cost of the smelting process, as the labour and number of keepers will be much less in proportion of the product of iron, which, under such proportions, will produce more soft iron with less fuel.

"My invention or plan for a furnace may also be used to advantage, either in whole or in part, in the construction of cupola furnaces."

The following correspondence respecting this invention appeared in last week's *Mining Journal* :—

"*To the Editor of the 'Mining Journal.'*

"Sir,—I am directed by the council of the South Wales Institute of Engineers to ask you to do them the favour of inserting, in your next paper, the accompanying letter, which, by their instructions, I have this day forwarded to Alger's Patent Furnace Company.—Edward Williams, Sec.

"'South Wales Institute of Engineers,
"'Merthyr Tydvil, Aug. 25.

"'Gentlemen,—I am instructed by the council of this institute to request that you will be so good as to omit from your advertisement the statement that the invention of Mr. Alger "was very favourably received at the late annual meeting of the South Wales Institute of Engineers," the institute having expressed no opinion on the subject.

"'Edw. Williams, Sec.

"'Alger's Patent Furnace Company,
41, Parliament-street.'

"[We publish this note as received, but we certainly do not see the sense or utility of it. A paper may be favourably received and warmly discussed by the institute, without their offering any opinion upon it as a body, and no one has yet stated they have done so. We understand the Staffordshire ironmasters are taking a far better method of deciding the question than talk-

ing and writing. Mr. R. Smith, one of the most experienced iron-makers in the kingdom, and who has the direction of Lord Ward's extensive works, is about erecting one of these furnaces, and we shall soon be in a position to know the result of an actual trial.]"

ELDER'S PATENT STEAM ENGINES AND BOILERS.

Mr. J. Elder, of Glasgow, engineer, has patented an invention which comprehends improvements particularly designed with the view of obtaining an increased advantage from the use of steam of high pressure, but also applicable where steam of low pressure is used. The portion of it relating to steam engines is applicable to the class of double cylinder expansive engines. According to this invention, two cylinders are used instead of a second large one, so that there are three in all. The three are placed in a line, and the steam is first admitted to the central one, then simultaneously to the other two, and finally to the condenser. The pistons of the two outer cylinders are connected to cranks on the main shaft placed diametrically opposite to the crank of the central cylinder, and the strains on the crank shaft bearings are thus more or less neutralised. In engines where no fly wheel is used, such as marine engines, two or more sets of three cylinders, such as have been described, may be used, the sets of cranks connected with the different sets of cylinders being placed at different angles; or the two or more sets of cylinders may be placed in different positions round the shaft, and be connected to one set of cranks.

In carrying out the improvements in steam boilers, according to one modification, the boiler is composed of a series of, say, four tubes or tubular vessels, of about two feet in diameter, for example, the lower ends of which are arranged in a diametrical line across a circular furnace. One tube rises vertically upwards from the centre of the furnace, and constitutes the axis of a series of spirals or helices formed by the other tubes. The two outer tubes, after rising vertically for a short distance, are curved or coiled round at the distance of two feet from the central tube, so as to form a two-threaded spiral or helix, the adjacent convolutions of which nearly or quite touch each other. The fourth tube is curved or coiled round in the annular space between the central tube and the outer tubes, so as to leave a space of about two feet between its convolutions, such space forming a spirally or helically shaped flue for the passage of the gases from the furnace. The upper ends of the tubes may be connected to a steam chamber, or any convenient arrangement may be adopted for collecting and conveying away the steam generated in the tubes. The lower part of the furnace may be enclosed by a cylindrical water space, which may be either closed and communicate with the tubes, or open and act as a cistern for partially heating the feed water before it is introduced into the boiler.

The details and proportions of the improved boiler may be modified in various ways, but the essential feature of this part of the invention is the employment, in the construction of steam boilers, of a number of tubular vessels of small diameter, as compared with ordinary boilers, arranged spirally or helically, in such a way as to form an enclosed spiral or helical flue or passage for the furnace gases.

LAMPORT'S PATENT WINCHES.

Northern Circuit, Liverpool.

WOOD AND OTHERS V. ADAMSON AND OTHERS.

Mr. J. Wilde, Q.C., Mr. Serjeant Cross, and Mr. Webster appeared for the plaintiffs; Mr. Atherton, Q.C., Mr. Manisty, Q.C., and Mr. Hindmarch appeared for the defendants.

This action was brought by the plaintiffs, who are engineers at Liverpool, against the defendants, who are ship-builders at Sunderland, for the infringement of a patent granted to Charles Lamport on the 19th June, 1850, for an invention of (among other things) an improvement in winches. This patent had been assigned to the plaintiffs by the patentee.

The invention consisted in adding to an ordinary winch an apparatus for working chains, termed a "gipsy," so as to make the winch applicable to working chains as well as ropes. The gipsy consists of a pulley fixed upon an axle, with which it turns, and has several pairs of projections, called "snugs," placed opposite each other at intervals around the groove of the pulley so as to form recesses to receive the links of a chain as they enter the groove alternately edgeways and sideways, and thereby preventing the chain from slipping when motion is given to the gipsy pulley by turning the axle.

The patentee by his specification claimed the combination of a gipsy with a barrel used for working a rope in an ordinary winch.

The gipsy and the rope barrel were both admitted to be old, but it was alleged that they had never been combined in the same winch, and the plaintiff called witnesses to prove the novelty of the combination.

On the part of the defendants, it was proved that a patent was granted to Thomas Pratt on the 23rd of February, 1839, for an improvement in ships' capstans and winches, which consisted in adding to them a pulley the same as a gipsy. Pratt's specification drawings, however, did not show a rope barrel, but only an ordinary pulley fixed upon the same axle as the gipsy, although it showed a rope barrel and a gipsy combined in a capstan.

It was also proved that a patent had been granted to Thomas Brown on the 20th of April, 1847, for improvements in the gipsies added to capstan, windlass, and other barrels, but the drawings did not show a winch containing both a gipsy and a rope barrel.

The defendants then called Mr. J. C. Gibson, who proved that anterior to the plaintiff's patent he had purchased Pratt's patent and made winches under it containing ordinary rope barrels as well as gipsies.

Mr. Wilde then admitted that he could not sustain the patent, and the jury at once found a verdict for the defendants, on the ground that the invention was not new at the date of the patent.

BETHELL'S PATENT ARTIFICIAL FUEL.

At all the gas works and places where coke is made large quantities of dust or very small coke are now produced, which are of very little value, and generally sold at a low price, under the name of breeze. Mr. J. Bethell, of Parliament-street, Westminster, whose inventions are well known, has patented an invention which consists in making a large coke of good quality or fuel from this breeze, which is effected in the following manner:—The patentee mixes the breeze with some coal tar, puts it into a common coke oven, and burns it the usual time, when a large coke of good quality is produced. He uses about 75 per cent. of coke mixed with 25 per cent. of tar or pitch, but does not confine himself to these proportions, as they may be varied with advantage; and other ovens or retorts besides the usual coke oven may be used, and this mixture may be burnt in heaps on the ground, but then the coke produced is not of such good quality as when it is burnt in ovens. The coke made in this manner, when burnt in ovens, will be much better in quality than the usual gas coke. He makes a fuel by mixing the breeze in the proportion of four or five parts of breeze with one part of coal tar or coal-tar pitch, and putting this mixture into iron moulds and baking them in an oven until the mixture is set into a solid block or brick. He also makes a fuel by mixing the breeze or small coke in the proportion of four or five parts of breeze with one part of coal-tar pitch, which he heats together in a heated pug mill or other mixing apparatus, and then puts the hot mixture into moulds, and presses it with a heavy pressure by pistons worked by steam, or by an hydraulic press. The patentee has not particularly described the apparatus for doing this, because it is well known as the patent fuel machinery, and many of such fuel machines have been described in different patents for making fuel with coal and pitch which would be applicable for this purpose.

PERFORATED BEATERS.

Messrs. Barrett, Exall, and Andrewes, the eminent engineers and machinists of Reading, have recently patented an important improvement in perforated beaters for thrashing machines, of which the following is a short description:—

The improved beater is made of a greater thickness at and near that part which is subjected to wear than at the ends or other part. Hitherto these beaters have been formed of plates or pieces of iron of uniform thickness, perforated, and then bent into the required form; and it has been found that the bending and the wear have reduced the thickness at the middle, where the beating action is exerted. By rolling the unbent bar thicker at the middle than at the ends, then perforating it and bending it to the required form, this defect is remedied without increasing the weight of the drum. The beaters are formed either of iron or steel, and perforated either before or after they are bent.

New Nasmyth Hammer at Portsmouth.—We have been much interested by the inspection of a model of a fifty-cwt. Nasmyth hammer, executed by Henry Padbury, belonging to the smiths' department of Her Majesty's Dockyard at Portsmouth. This beautiful piece of workmanship is on an inch scale, and represents the Nasmyth of which Padbury has charge. It is made entirely of wrought iron, and does great credit to the skill of its manufacturer. We understand that it is to be exhibited at the Sailors' Home.

HART'S PATENT GAS REGULATOR.

Mr. Herbert W. Hart, of Birmingham, gas engineer, has recently introduced a method of regulating the pressure of gas in its transmission to gas burners, by the introduction of a regulator in the main pipes through which the gas passes, whereby a steady and nearly uniform pressure is maintained at the burners, whatever may be the pressure from the source of supply. This regulator consists of a chamber filled with a fibrous material, so that the gas in its passage must pass through or amongst the fibres. In preparing this permeable fibrous body the patentee takes layers of felt or other fibrous material, and makes up a sufficient thickness according to the initial pressure of gas, the fibres being disposed transversely to the passage of the gas, and held together by perforated or other porous plates. By means of suitable connections between these porous plates he causes the fibres to be compressed more or less, according to the density of the body required, which will also be according to the initial pressure of the gas. The fibrous material being held somewhat loosely together, the pressure of the gas produces this effect. The greater the initial pressure becomes, the more the fibres are compressed together, rendering it more difficult for the gas to permeate. Thus, by the self-action of the gas on the regulator, the exit pressure is regulated and rendered uniform. In order to intercept the grosser impurities of the gas before passing through the regulator, he places a little loose wool between the ingress passage and the body of fibrous material before mentioned, which latter also has a similar effect in filtering and purifying the gas.

Steel Steamships.—Mr. Clay, it appears, is succeeding well in his attempts to introduce Riepe's metal, two more vessels, entirely of this material, being now in course of construction at Mr. Miller's yard. The use of steel appears likely to become pretty generally employed in place of iron —an equal strength being obtained with much less weight. On the Mersey four steel vessels are building, and on the Clyde five. In all cases where a light draught of water is a desideratum, steel has undoubted advantages, and the manufacture of cheap steel should, therefore, be encouraged to the greatest possible extent. — *Mining Journal.*

MANNING'S PATENT SEWAGE MANURE.

Mr. J. A. Manning, of the Inner Temple, who has devoted much time and study to the sewage manure question, and patented several inventions connected with it, has just completed a further patent for the manufacture or production of manures or fertilizing agents from sewerage liquors, in combination with the dry wastes of towns. The patentee proposes to collect the sewerage flow in suitable tanks or reservoirs, and there mix it, for the purpose of precipitating the solid matters with alum sludge, or its chemical equivalents. The supernatant and clarified liquid is then permitted to flow off, and may be advantageously employed for the irrigation of land. The remaining solid or semi-fluid matter resulting from the treatment is then deposited in a suitable receptacle, and mingled with the dry wastes or refuse of towns, including refuse matter from manufactories, and all those matters contained in the house, dust-bins, pits, &c., such as ashes, decayed refuse vegetable matter, fæcal matter, and also, if found advantageous, the sweepings, droppings, and offal of roads, streets, and markets, and other refuse matters of a fertilizing nature, which do not form a part of the ordinary sewage discharge. To facilitate the formation of this mixture into matter sufficiently solid for carting, the refuse matters, before being added to the sewage, may be more or less ground or pulverized if found desirable. By this means a solid, easily portable fertilizer of great agricultural value will be obtained.

GEOLOGICAL DRAINAGE.*

Gentlemen,—I must again trespass on your valuable space, to reply to what I cannot but designate an impertinent personal attack on me and my plan, emanating from the pen of your correspondent F. G. Mulholland. There cannot be much said for his consistent advocacy of the cause of the engineers, than whom there is not a more eminent or respectable class in society, whether considered as the projectors and successful performers of the wonderful achievements of modern engineering and science, which have more than all else contributed to raise this country to the eminent position that it now occupies, or whether considered as social members of society. Verily we should be at a low ebb indeed if no better advocate could be found than one who, if any member projects a scheme for the good of

* We have been compelled to reduce the length of this letter.—Eds. M. M.

the community not altogether palatable to him, descends to so low an expedient as to load that member with personal abuse, instead of confining his objections to the question at issue. I defy your correspondent to point out one passage in my communications to the press wherein I have sneeringly castigated "that unfortunate class," as he is pleased to style them, of which he claims the honour of being a member. I think the great misfortune is, having a member who does so little honour to his profession, in using such language as this and similar, that occurs more or less throughout his letter. I again repeat what I before said, and which has given such mortal offence to your correspondent,—Engineers and scientific men either do not study this science (geology), or they have overlooked it in devising their plans. What offence can be taken at this? I was speaking generally; doubtless there are many eminent exceptions, but they are not in the list of those who have come forward to solve the great problem of the effectual drainage of the metropolis of the world—at least, such do not appear.

If Mr. Mulholland will do me the honour to give me a call any morning before ten, I will, in ten minutes, convince him that I have more practical knowledge of this science at my fingers' ends than he possesses; else he would not talk of acquiring a practical knowledge of geology by a survey of the Thames. Having faith in my project, I felt confident I could meet any objections that might be urged; and in this I am still as confident. Is this inconsistent with the respect due to the profession? I may here express the opinion, that the present enlightened age is the age for great achievements, and their great success lies in the fact of the laws of nature being more closely followed than formerly; therefore I maintain, much as your correspondent may sneer at my opinion, that nature has not been sufficiently studied in devising the several schemes that have been brought forward for effecting this great work.

Your correspondent goes on to give an account of what his father did in 1806, and what he himself has subsequently done; but in all this I am at a loss to conceive what analogy there exists between this and the important question at issue. If this be the sum and substance of his practical experience, it amounts to little indeed, when adduced as an evidence of his ability to deal with this great question. He tells us that his experience is founded on his reading, at school, "Macartney's Embassy," and the sinking and boring of the Celestials. I can tell him my knowledge has been acquired, for the last twenty years, in the school of practice—not celestial, but terrestrial. Your correspondent says he waited to see the effects of the lime on the sewage. What! he a chemist, and yet waits to see this? I had no such doubts in my mind; my practical experience told me it would not do. He farther says I have patented another man's ideas. In reply, I would beg to tell him that he never laboured under a greater mistake. I have, it is true, published the principle of my scheme, but not the details. The fact is, your correspondent is both too late and too early; he is too late in bringing forward his own plan to justify him in laying claim to originality, for I could tell him something that probably would make this clear to him; and he is too hasty in denouncing my plan before he was furnished with details. He writes like a disappointed man, and so consoles himself by battering another, who, from practical experience and energy, has gone ahead of him; but yet he should be consistent, for, if my plan is so identical with his, in condemning one he must condemn the other.

He says "unfortunately" one fact fatal to the practicability of my scheme intrudes itself; that is, the chalk formation does not and will not absorb any amount of liquid. Certainly, there is a limit to all things. I do not ask your correspondent to believe it possible to drain the sea dry through this medium; but quite sufficient is established, even upon his own showing, for the purposes of this metropolis. Let Mr. Mulholland sink a shaft into this strata, and attempt to fill it up; but I must choose the locality, for judgment may err in this respect. Does he lose sight of the artesian wells, which give us an unlimited supply? I could fill a page in your valuable journal on this one point, but I refrain from trespassing too much on your valuable space, merely remarking that I do not confine myself to any particular strata, seeing that, if necessary, I can reach the upper and lower green sands.

I now come to your correspondent's proofs that I am only a mere theorist. He says no provision is made for getting rid of the noxious gases in the sewers, or destroying the malarian effects of the exhalations arising from my deodorizing pits, shafts, &c. How does he know this? and how does he know that by the adoption of my combined plans such evils will exist? To make his mind easy on the subject I will tell him all this has been well considered, and remedial plans matured. I have a plan for ventilating sewers, simple, effective, and cheap, not yet patented, consequently not yet published.

Then he tells me I have evidently no idea of the quantity of sewage to be contended with daily, otherwise I would not

mention pipe communication. Does he think that in any engineering operation in which I may be engaged, having a quantity of water to run off, I should lay down my pipes before I had calculated what I had to pass through them? And have I yet told him the size of the pipes I mean to employ?

Now for your correspondent's calculation. He tells us that his plan is to cost £500,000; mine, he says, is to cost £4,300,000. Let us see. I will tell him, first, that I operate only on the main sewers, into which all the others, with the drains, empty themselves. It has been considered by the authorities in considering my plan, that less than twenty shafts will suffice to discharge the whole of the sewage, but I will take twenty as the maximum; I will then take Mr. Mulholland's estimate of the cost of each shaft, even though it be more than double my estimated cost. Take, then, £20,000 as the cost of each shaft, and multiply by 20, this gives £400,000; this shall include turbines, pumps, fountains, and other "wim-wams," as your correspondent facetiously terms the "adjuncts," for, seeing his estimate is double that of mine, I may safely include all this.

I have only to say that I am quite prepared to take a contract to drain London effectually for one million of money, and could insure myself out of this a round £300,000. Contracts are not new to me. Besides this I would realise something like £50,000 a-year out of the solid sewage matter, by the application of my system of deodorization and precipitation, being economical, simple, and expeditious,—thus occupying a small space, requiring inexpensive stations few and far between.

Why, I ask, should your correspondent drag in that eminent institution, the Museum of Practical Geology, in the sneering manner he does? For my part I should consider it a distinguished honour to be a member of such an institution. I do not consider them mere theorists only, as your correspondent seems to imply.

I think it is now shown that I can safely challenge scrutiny, since even your correspondent fails to show one fallacious point in my scheme, and from the spirit in which he writes he would, doubtless, do so if he could. He has thus done me some service, for which I am obliged.

If I am a humble individual I am content to walk in the paths of others and pick up a few of the gems overlooked by them; and, if by the exercise of my mental powers and my practical experience I can be useful to my fellow-men, I shall be still more content, remembering what such men as Watt, George Stephenson, Hugh Miller, Cook, and others eminent for their energy in carrying out the projects that spring from the rich store of their prolific and Herculean minds, had to contend with; yet they all triumphed!

Apologising for the length of this letter, which in justice to myself I have penned,

I am, Gentlemen, yours, &c.,

RICHARD JEX CRICKMER.

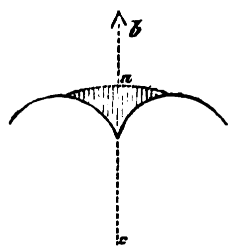
101, Borough-road,
Aug. 24, 1858.

THE SAILS OF VESSELS.

GENTLEMEN,—One of the most important questions for England must always be the question of navigation, and anything contributing towards the improvement of the same deserves, undoubtedly, the deepest interest of the public. I will, therefore, explain how the speed of sailing vessels may be considerably increased, without

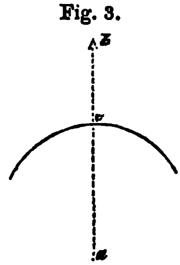
Fig. 1.

Fig. 2.



increasing the number of the sails. To explain it: Let two kites be taken of equal dimensions, but of different elasticity, so that one when acted upon by the wind bends like fig. 1, and the other like fig. 2. The surface opposed to the wind is greater in fig. 1 than in fig. 2; but, as every boy knows who understands this Chinese amusement, fig. 2 will pull more powerfully than fig. 1. This proves that it is

Fig. 3.



not the extent of surface which gives supe-

rior power to the kite fig. 2. Now, if a sail is taken of the kind in present use, fig. 3, it will be even inferior to kite fig. 1 in effect. The reason is the following:—The air is moving from *a* to *b*, fig. 3, and is interrupted by the opposing body. Now, in the case of the sail, *c* being the highest point, the air moves around the curvature of the sail from all sides, uniting at *c*, so that the density of the air is preserved all around the curve; but by the kite fig. 2 it is very different, for the current moving over each curve united at *a*, leaves the air in a rarified condition in the space indicated by the lines, because the air moves with equal velocity from the back of the kite towards *b* as it does from *c* towards the kite, so that the cavity becomes never completely filled, and we have two forces acting, — the force of the current and the atmospheric pressure. Now, to produce the same effect through a ships' sail, a network could be so arranged that the sail must press through it so as to produce a number of deep cavities, like by the kite, but in such a manner that the current cannot enter them from either side, and they might be rendered far more effective even than they are by a common kite, and in that case the ship will be propelled by the two combined forces which act upon the kite. Those well versed in ships' rigging should consider how the network could be best introduced, but always bearing in mind that the cavities are of the required shape, and I should be glad to see some suggestions forthcoming.

Those who are acquainted with yachting will have noticed that, when the wind gets very high, the yacht bends over so much that the masts almost touch the water, and the yacht receives scarce any impulse at the very moment when the wind is strongest. That should also be altered, and I will show later how it can be done in a simple manner. But the greatest disadvantage exists in the present application of steam for ship-propelling. There is a truly monstrous waste. Let any one consider what a prodigious power it requires to bring such a strong structure as a steam vessel into such a great vibration that the very beams shake under one's feet, and let him reason thus logically:—Since it requires a great power to put the vessel into such vibration as the present steam engine does, and since it is not the purpose of the engine to shake the ship, but to propel it, that portion of the power which shakes the ship is not alone wasted, but employed to the disadvantage of the structure, and that portion is in most instances five parts out of six. Truly monstrous! Although one not acquainted with my theories could not see it any more than if I had stated that I could propel a sailing vessel quicker even with less sails, had I not explained it in the theory of the kite: no more could he see how easily it might be altered, and what a considerable saving in coals could be effected.

I am, Gentlemen, yours, &c.,
J. Meyer.

1, Red Lion-square, Holborn.

Fortifications at Gosport.—Three more large forts are to be forthwith commenced in the neighbourhood of Gosport, which will complete the cordon of batteries intended to surround this important port. Large cavalry and infantry barracks are also to be built near the Gomer Fort, which, with the extensive barracks just completed at Gosport, and the numerous other military establishments already existing, will form this promontory into an immense *place d'armes* for the south of England.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

Johnston, J. *Improvements in bonnets, caps, and other coverings for the head.* Dated Jan. 23, 1858. (No. 128.)

This relates to the use of hair cloth for bonnets, caps, &c. The hair cloth may either be purely of hair, or it may be woven as a composite fabric with other materials, and it is blocked to form in the usual way.

Craven, J., W. Hey, and C. Worsnop. *Improvements in actuating rotary shuttle boxes of looms.* Dated Jan. 23, 1858. (No. 130.)

Upon a shaft of the loom is affixed a tappet sliding on it, though controlled to rotate with it. The sliding of the tappet is effected at the times desired by Jacquard or other pattern surface, and is for the purpose of placing the tappet in position for acting upon one or the other of a pair of levers, or so that it may rotate free of either of them. These levers turn each upon a centre, and are connected to catches or drivers for operating upon studs or teeth in a wheel to give rotary motion thereto, one in one direction, the other in the opposite. The wheel is provided with studs and segmental pieces to act upon a star wheel affixed upon one end of the box or series of shuttle chambers. Steadying means are applied to hold the wheel operating the star wheel to prevent motion, except when operated by the catches or drivers.

Welch, J. J., and J. S. Margetson. *An improved expanding or folding travelling bag or wallet.* Dated Jan. 23, 1858. (No. 132.)

This consists in a bag or wallet without any metal framing as heretofore, and made of American cloth or leather. It is composed of a series of pockets, so arranged that when various articles are placed therein it is folded over and fastened by two lengthening straps, fastened to a cross piece or strap which forms a handle. The bag or wallet being without any framing may be expanded to any width, according to the quantity of articles inserted. When not in use the whole may be folded up into a small space.

Huber, J. J. *Improvements in the constructi[illegible] of brooches, bracelets, pins, and other articles [illegible] jewellery.* Dated Jan. 23, 1858. (No. 133.)

The system of construction upon which this [illegible]vention is based rests in great part on a seri[illegible] of rings or other pieces, fixed together by screws or

pin joints furnished with springs. The several pieces of the ornament being capable of movement, one can give to it new forms at pleasure, without having recourse to a jeweller.

WALL, A. *An improved lubricator for the moving parts of machinery.* Dated Jan. 25, 1858. (No. 134.)

The inventor takes any fatty or oleaginous matter and combines it with mercury, by triturating or rubbing them together, until perfect saturation takes place, and, having ascertained the exact amount of mercury absorbed by the grease, he places it aside, and denominates this mixture A. Or he takes the oxides of mercury, and, after having weighed and dissolved them in boiling water, he discharges or neutralises their acid base by the addition of potash or ammonia until super-saturation. In this state he mixes it with fatty matter until perfect saturation, and sets it aside under the denomination B. To prepare the hydro-silicate of potash, he takes quartz, silica of sand, or flints, places it in a furnace, and brings it to a white heat. He then rakes it out of the furnace into cold water, which makes it fly into fragments. He places these under a crusher and grinds them into an impalpable powder. When in this state he takes equal quantities of carbonate of potash and carbonate of soda, or other preparation of soda, and a similar weight of the powdered silica, and places them in a crucible or furnace (he prefers a platina crucible); he then raises a fire and melts. When melted, he withdraws the mass, and dissolves it in hot water. As soon as the silica is dissolved out, he throws the mass into a gelatinous hydrate by the addition of a mineral acid. He then evaporates until it comes to a pasty consistence, and in this state he sets it aside and denominates it C. He then takes dry sulphate of zinc, which he exposes to a current of dry ammonia, which absorbs it, producing a white powder which perfectly dissolves in water; or he takes dry sulphate of zinc and exposes it in a crucible to a heat that evolves flowers of zinc. The various preparations having arrived at this stage, he takes fatty matters and places them in the vessels containing the hydro-silicate of potash, and boils, adding the flowers of zinc in combination with the hydrate, by which means he unites the olein and stearine with the zinc. After the mass is well mixed with the hydro-silicate, C, he ladles it out, and passes it through a series of strainers, and thence into vessels prepared for its reception, which he terms the mixing cisterns, and adds A or B in certain proportions. The several mixtures are combined in various ways to suit the different kinds of metals or materials to be lubricated.

DERING, G. E. *Improvements in the permanent way of railways.* Dated Jan. 25, 1858. (No. 135.)

The inventor connects the successive separate rails, 1. By soldering with any suitable metal or alloy, employing by preference "hard soldering" or "brazing;" or, 2. By "autogenous soldering" or "burning together," a sufficient degree of heat being applied to cause union by the partial or complete fusion of the metal of the rails; or, 3. By a welding process. The heating may be conveniently accomplished upon the spot in almost all situations on a line of railway, by the use of a small portable smith's forge with bellows or fan. Or in some cases he employs a blow pipe apparatus, in the use of which he prefers a combined jet of coal gas and atmospheric air, the gas being conveyed in portable reservoirs, in some cases in a compressed condition, to the parts of a railway remote from gas works.

GARNETT, J. and P., jun. *Improvements in the manufacture of felt.* Dated Jan. 26, 1858. (No. 136.)

This consists in manufacturing felt from woollen rags. The woollen rags, which may be of the coarsest description, are first reduced to short ...s by a rag or other machine. The woollen ... or shoddy thus produced is spread by prefer...e in a wet state to the required thickness over the boiler or other article to be covered, and it is then matted together by beating. When thus matted together the exterior surface is covered with a coating of finer pulp, or a combination of pulp and clay, to render the whole air-tight and waterproof.

STRACEY, Sir H. *An improved cartridge.* Dated January 26, 1858. (No. 138.)

This invention was described and illustrated at p. 129 of No. 1800, Vol. 68.

NEWTON, W. E. *A new or improved fabric intended principally as a substitute for leather.* (A communication.) Dated Jan. 26, 1858. (No. 140.)

The fabric is composed of cotton or other fibrous substance, either woven into cloth or in an unwoven state, saturated and coated with a compound of linseed oil and burnt umber. This compound is prepared by boiling in every gallon of oil about 3 lbs. of umber, in a powdered state, for such a length of time that the composition, when cool, will roll in the hands without sticking.

CORBELLI, L. F. *A new or improved process for obtaining aluminium.* (Partly a communication.) Dated Jan. 26, 1858. (No. 142.)

This relates to the production of aluminium by heating to whiteness a mixture of silicate of alumina or clay with twice its weight of ferrocyanide of potassium and 1½ times its weight of chloride of sodium.

HARTHAN, J. and E. *An improved engine for obtaining motive power.* Dated Jan. 26, 1858. (No. 144.)

This relates to obtaining motive power by the aid of a rotary engine of a peculiar construction, which may be worked either by steam or compressed air, whereby the direct pressure in conjunction with the reactive force of the propelling medium is made available. The engine which the inventors propose to employ consists essentially of a plate wheel fitted with a number of peculiarly constructed projections forming chambers, similar to the buckets of an overshot water wheel. Each chamber is divided from its neighbour by a thin metallic plate, curved and inclined a little towards the centre of the wheel. Jets of steam or air are brought to play into these chambers, entering nearly at a tangent to the periphery of the wheel. Or they may be so directed as to enter the chambers at the sides, but in a direction nearly tangential to the circle of chambers. The steam or air, on issuing, enters the chambers on one side, impinges against and passes over surfaces of curved bottoms thereof, and issues out on the other side of the spaces nearly in an opposite direction to that at which it entered, thus imparting its force to the wheel by pressure and reaction, and causing it to revolve.

BIRD, A. *A new or improved spring platform or mattress for bedsteads and other articles used for sitting, lying, or reclining upon.* Dated Jan. 27, 1858. (No. 147.)

This consists of a platform or mattress the upper surface of which is composed of a series of horizontal boards, connected together by webbing, and supported upon a foundation by spiral springs.

MIDGLEY, J. W. *An improved construction of covered roller to be used in preparing and spinning machinery.* Dated Jan. 27, 1858. (No. 149.)

The inventor employs metal for the base of the roller, and holds the leather or other covering material in its place by the grip of two pressing plates.

KOTTULA, C. N. *Improvements in the manufacture of neutral soap.* Dated Jan. 28, 1858. (No. 151.)

This consists in adding to any ordinary neutral soap tallow, fatty materials, lime liquor, and concentrated soda leys, producing a cheaper neutral soap than heretofore. The fatty materials employed may be any of those usually used for soap-making. The density of the soda ley employed is, at least, 30 deg. Baumé, and is mixed with alum in the proportion of about 3½ lbs. to each cwt. of the concentrated ley. The lime liquor is prepared by adding to lime water sal ammoniac in the proportion of about half a pound to each cwt. of lime water.

BUSSI, P. *An improved railway carriage.* (A communication.) Dated Jan. 28, 1858. (No. 152.)

This consists of a new system of framing for all kinds of railway vehicles, whereby the centre of gravity of the vehicle may be lowered at pleasure, independent of the diameter of the wheels. This is effected by the following means:—1st. The vehicle is suspended from the axle boxes. 2nd. The traction mechanism or drawing gear of the vehicle is placed below the pivots of the axles, and made to act in a vertical plane passing through the longitudinal axis of the vehicle. 3rd. The wheel apparatus can be altered at pleasure, to suit either the position or the diameter of the wheels of the carriage placed upon them.

CABMMEBER, C. *Improvements in the apparatus for cleaning the top rollers and fluted rollers of the different spinning machines.* Dated Jan. 28, 1858. (No. 153.)

This relates to a method of clearing pressure and fluted rollers or cylinders, by means of cleaning rollers covered with leather or other soft substance, and consists in attaching to suitable framework a lid or cover, in which the aforesaid cleaning rollers easily revolve, carrying one or more endless bands which rub against the cylinders or rollers to be cleaned; the velocity of the cleaning rollers and bands can be regulated at pleasure.

SPENCE, W. *An improved pot for chimneys and ventilation.* (A communication.) Dated Jan. 28, 1858. (No. 154.)

This consists in manufacturing chimney pots so that the mouth for the exit of the smoke or air may be protected, and the smoke or air within the pot receive an upward tendency from the action of the wind. This is effected by providing the pot with an upper or outer lip or cap projecting above, and at a small distance from, the inner shaft, and placing around such inner shaft a space or a series of spaces so situate in reference to an inclined surface below that the wind will be deflected upwards.

JOHNSON, J. H. *Improvements in the manufacture of metal pipes, and in the apparatus employed therein.* (A communication.) Dated Jan. 28, 1858. (No. 156.)

This relates to lead and other soft metal piping, and consists in applying a coating or lining of tin during the manufacture. The pipe itself is produced by a press, which forces the metal continuously through a die in the ordinary manner; but, to effect the internal tinning of the pipe, it is proposed to employ an internal fixed mandril of a fixed construction. The mandril is fixed to a cross piece inside the cylinder of the press, and immediately beneath the die or draw plate against which it bears. The middle portion of the mandril is smaller than the top and bottom, so that an annular space will be left between the sides of the mandril at that part and the interior of the pipe, the upper portion filling the interior. So soon as a short length of the pipe has been passed through the die or draw plate, melted tin is poured in. As the pipe now exudes from the die the melted tin passes out through perforations at the bottom of the mandril, and fills the annular space between the pipe and the middle portion of the mandril, thereby depositing a coating on the inside of the pipe as fast as it comes from the die. This coating is smoothed off by passing over the enlarged collar at the head of the mandril, which also acts as a soldering iron, compelling the tin to adhere to the interior of the pipe.

ARMITAGE, T. *Improvements in elastic fabrics.* Dated Jan. 28, 1858. (No. 157.)

This relates to a fabric applicable for boots and shoes, &c. The essential feature consists in the combination of elastic india rubber or caoutchouc, either in the form of thread or of a thin sheet, with cloth of an open texture, so as to produce an elastic fabric having an even face without corrugations or puckers.

BETHELL, J. *Improvements in the manufacture of coke and fuel.* Dated Jan. 29, 1858. (No. 159.)

This invention is described at p. 230 of this Number.

ELDER, J. *Improvements in the arrangement or construction of steam engines and boilers.* Dated Jan. 29, 1858. (No. 162.)

This invention is described at p. 229 of this Number.

BROOMAN, R. A. *Improvements in apparatus for measuring water, gas, and other fluids.* (A communication.) Dated Jan. 29, 1858. (No. 164.)

This consists in the employment of a pendulum in, or in connection with, apparatus for measuring fluids, so that the vibrations of the pendulum shall be regulated in extent by the rising and falling of a float, and shall be indicated upon suitable dials, the hands of which are moved by clockwork under the control of the pendulum.

WEARE, R. *Improvements in galvanic batteries.* Dated Jan. 29, 1858. (No. 165.)

This cannot be described without engravings.

WOTHERSPOON, J. *Improvements in railway breaks.* Dated Jan. 29, 1858. (No. 166.)

This consists in the application of a spring or elastic medium for improving the working effect of the brake blocks. The spring, which may be a metal helix or coil, is interposed between the actuating power and the actual brake blocks, and may be variously arranged.

HART, H. W. *Improvements in regulating the pressure of gas.* Dated Jan. 29, 1858. (No. 168.)

This invention is described at p. 231 of this Number.

KAYE, W. and C. *Improvements in mattocks, picks, hoes, hammers, and similar implements and tools.* Dated Jan. 30, 1858. (No. 169.)

The patentees make the eye for receiving the shaft or handle in mattocks and picks so as to form a boss or socket of greater depth through the eye than usual. They also make the eyes taper, or wider on one side than the other, the handle being inserted at the wide side, and secured therein by a screw bolt or pin passing through the socket into the handle, thus dispensing with wedges for such purposes; they can easily remove and replace the handles without injury.

NEWLING, J. *An improved truss for hernia.* Dated Jan. 30, 1858. (No. 172.)

This invention requires engravings to illustrate it.

COLEMAN, R. *Improvements in agricultural implements.* Dated Jan. 30, 1858. (No. 173.)

This relates, 1. To apparatus for raising and lowering the tines, hoes, &c., used ploughing, hoeing, or scarifying land. Hitherto in implements for this purpose, in which two or more instruments of cultivation have been combined in one machine, and in a particular implement patented by the patentee 22nd May, 1845, the apparatus for raising or lowering the instruments by hand has consisted of a single lever fixed on the shaft, to which all the instruments were connected. The length of the lever necessary is very objectionable. In this invention, he places this hand lever on a fulcrum near the fore part of the machine, and connects it by a link with an arm on the barrel with which the instruments are connected. He also applies a second hand lever, which he connects to the first by a link or chain, which can be hooked or unhooked as required. The second hand lever acts on the first, thus affording a compound leverage when great power is required. 2. To a further improvement in such implements, which consists in extending the breadth of the frame work at the back part, and placing instruments to act on the soil immediately behind the wheels, thereby cutting up and obliterating the track of the wheels. The last part relates to the fixing of the shares, scarifiers, or hoes to the prongs, tines, coulters, or other parts by which they are carried. The invention cannot be completely described without engravings.

TAYLOR, T., sen., and T., jun., H. NELSON, and H. SPENCER. *Improvements in steam engines, and apparatus connected therewith.* Dated Jan. 30, 1858. (No. 175.)

This relates, 1. To lubricating pistons. The patentees form holes in the sides of the cylinders in

two ranges, one above the other, and connect them by pipes so situate that when one is closed by the piston another is open to the cylinder, so that steam may then enter and force outward the lubricating material. They apply the oil by means of apparatus capable of closing to the cylinder when a vacuum is formed, and of resisting the pressure of steam. 2. To a method of giving a notice when the engine is running beyond or below its speed. They apply tappets to the governor, which come into operation upon a bell when either of the above defects takes place. Also they cause the governor, when the engine is at undue speed, to act upon a train of wheels for registering the number of strokes during such defects. 3. To steam gauges. They employ weights attached by levers to pulleys, which are caused to turn upon their axes by the pressure of the steam, of which motion the levers and weights will therefore partake. The pulleys they cause to revolve through the medium of a rod exposed to the steam pressure, and connected to the pulleys by a cross head.

Ashcroft, P. *An improved mode of supporting the rails of railways in their chairs.* Dated Jan. 30, 1858. (No. 176.)

The chief object here is to provide for supporting double-headed rails in their chairs, so that their under surface shall not be injured by contact with the chairs. The patentee suspends the rails in rigid chairs of a peculiar construction, by the use of filling or supporting pieces, which may be iron or wood, placed one on either side of the rail, and forming therewith a compound wedge.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

Burn, C. *Improvements in the manufacture of iron cables and chains, which improvements are applicable to the manufacture of gold and other chains.* Dated Jan. 23, 1858. (No. 129.)

This consists of a mode of making chain cables and other iron chains from a bar of iron rolled to the form of an X; no forging or welding is required. The same process may be applied to the manufacture of gold chains. It cannot be described in detail without reference to the drawings.

Slack, E. *Improvements in the treatment or preservation of potatoes and other amylaceous vegetable substances.* Dated Jan. 23, 1858. (No. 131.)

This relates to an invention for which Mr. Slack obtained provisional protection 3rd Dec., 1857. According to this invention, the potatoes (or other vegetables) are primarily subjected to the action of acids and alkalis, as well as to that of diastase in solution, and other saccharine matters.

Hill, P. *Improvements in machinery for making cams and for cutting and shaping metals and other materials.* Dated Jan. 26, 1858. (No. 137.)

The inventor constructs a machine in which the cam to be cut is mounted on a mandril or shaft, revolving slowly. In front of, or over the cam, is a lever, whose length is variable, and is adjusted so as to be equal to that of the lever which is to carry the roller which is to work on or in the cam. The fulcrum of the lever is also adjusted so as to correspond with that of the roller lever. The lever carries a circular cutter whose position can be varied, and which may consist of cutters fixed in a chuck or plate, and adjusted at a distance from the centre equal to the radius of the roller which is to work on or in the cam. If the cutter be now made to revolve rapidly while the cam revolves slowly, and if at the same time the cutter lever be caused to move at the rates, and at the times, and to the extent that the roller lever is required to move, the effect will be that the cutter will cut the cam to the required shape. He communicates the required relative motions to the cutter lever and to the mandril by means of original cams of any desired form, or by a crank motion, or other means, in connection with the gearing of the machine. The extent and the times of the motions are adjusted by means of inclined planes, or a bar or bars whose inclination can be varied, in connection with change wheels, variable levers, pulleys with steel bands, or other similar means, so as to cause the cutter lever and the cam to move at the proper rates.

Simcox, G. P. *The application of certain materials in the manufacture of carpets.* Dated Jan. 26, 1858. (No. 139.)

In all cases of carpets, whether Brussels, tapestry, Venetian, or other descriptions where worsted has been hitherto used as the warp or pile threads, the inventor proposes to introduce cotton of a soft description.

Newton, W. E. *Improved machinery for mining coal and other mineral substances.* (A communication.) Dated Jan. 26, 1858. (No. 141.)

This machinery is chiefly intended for undermining and slide-cutting coal, but is also applicable in other operations, and consists principally of a rotary cutter wheel of suitable construction, and furnished with an arrangement of cutters to cut in a direction perpendicular or at right angles to its axis. These cutters are attached to the periphery of a wheel mounted in a carriage travelling upon a stationary frame, a feed screw moving the carriage and cutter wheel perpendicular to the axis of the cutter wheel, as it cuts its way into the coal or other substance to be mined. The machine cuts a groove directly into the walls of a mine, parallel either with the floor or walls, and as close as desirable thereto, so as to permit the masses above or at the sides of the grooves to be subsequently removed by wedging out or blasting. The cutting instrument is formed of a combination of chisel-edged cutters and oblique-edged cutters, applied to the periphery of the horizontal cutter wheel, and they are arranged in such succession as to cut different parts of the groove that require to be made. By the mode of constructing and fitting together the cutter wheel and the head, the axle of the wheel is supported in bearings that in depth do not exceed the thickness of the wheel. By this means the cutter wheel is enabled to cut its way beyond its axle, which will be able to enter the grooved by the wheel.

Hirst, W. D. *A stand for soda-water bottles and other bodies of a similar form.* Dated Jan. 26, 1858. (No. 143.)

This is designed to obviate the inconvenience which arises from the tendency of a soda-water bottle to roll when placed upon a table, and consists of a stand having a suitable hollow to receive a portion of the convexity of the bottle.

Heaton, R., jun., and G. *An improvement or improvements in annealing metals.* Dated Jan. 26, 1858. (No. 145.)

The inventors place the vessel containing the heated articles on a stand in a second vessel. Water is poured in the larger vessel, so as nearly to fill the annular space between the stand and the sides of the vessel. A third vessel, which may be bell-shaped, is inverted over the annealing vessel, its edge dipping in the water, and thus forming a water joint between the interior of the bell-shaped vessel and the atmosphere. The annealing vessel and its contents are allowed to cool under the bell-shaped vessel exposed to the action of only the small quantity of oxygen contained in the air of the bell-shaped vessel.

Mottram, T., J. Edwards, and J. Mitchell. *Rolling steel, iron, and other metals, and also for tilting the same for cutlery and other purposes.* Dated Jan. 27, 1858. (No. 146.)

This consists in rolling metals for cutlery and other purposes, instead of forging it as now. The rollers are to be so cut, fluted, or bevelled as to form the metal of the required shape. It is afterwards cut into proper lengths for table knives, butcher knives, bowie knives, razors, scythes, swords, bayonets, and other implements.

WAINWRIGHT, G. J. *Improvements in drawing fibrous materials.* Dated Jan. 27, 1858. (No. 148.)

Instead of the usual plan of drawing fibrous materials by friction rollers, the inventor proposes to drive the top rollers, whether fluted or plain, by ordinary wheel gearing, so as to avoid the variations of diameters now complained of, and also the irregularities of counts caused by slipping, &c.

NAPIER, J. M., and W. THORBURN. *Improvements in machinery for planing, shaping, and slotting.* Dated Jan. 28, 1858. (No. 150.)

This consists in placing two cutting tools together in the tool holder, so that, by a vibrating or reciprocating action imparted to the holder, the cutting edges of the tools are brought alternately into action. One tool, having two cutting heads or edges upon its stem, may be employed. Suitable means of adjustment are employed by which the alternate cuts are regulated.

LIOUVIL, E. *Improvements in apparatus for aerated liquids.* Dated Jan. 28, 1858. (No. 155.)

This has for its object entirely to do away with the metal tubes in the interior of the apparatus, which latter consists of a vessel, in the form of a jug or bottle, in the interior of which is left a pipe opening at one end in the spout of the vessel, and at the opposite end in the lower part, thus allowing the aërated liquid to escape from the interior of the vessel whenever the obturator by which the pipe is kept closed is sufficiently removed for allowing the aërated liquid to pass through the pipe. The vessel has another opening for the introduction of the liquid to be aërated, and of the powders for that purpose, or of the gaseous liquid.

FOX, W. T. *Improvements in the bending and reefing of ships' and other vessels' sails, together with a new application for the leeches and foot.* Dated Jan. 29, 1858. (No. 158.)

The inventor substitutes for the rope used for binding sails galvanized iron chains. To the top of the sail, and on the chain, are a number of links through which he passes the jackstay before the sail is sent aloft. When the sail has been hauled up by placing the jackstay (which is then connected to the sail) in a number of hooks or cleats fastened in the yard, it is ready for use. He affixes to the after side of the yards at the earrings small dogs, to which are to be fastened the cringles (which may be made of a similar chain to the leeches) or reefs of the sail when reefing. By drawing the sail on to the yard and fastening it to the dogs with a piece of marline, it will be impossible for it to get under the yard.

TOOTH, W. H. *Improvements in polishing plate glass, sheet glass, and other substances.* Dated Jan. 29, 1858. (No. 160.)

This consists of improvements in polishing and finishing glass, &c., upon an ordinary polishing table, such as generally used with a to and fro motion, by a line of polishing blocks acting upon the glass laid upon the table, for polishing and finishing it as the table moves under the polishing apparatus. The present invention is for the purpose of subjecting every part of the surface of the glass in succession to the action of the polishing blocks, so that those parts near or about the edges or sides of the table may be rubbed with an equal velocity and continuousness by the blocks as the middle portions. The inventor causes an additional block to be attached to each end of the polishing apparatus. To prevent the faces of the additional polishing blocks from being worn by crossing the edges of the glass, he places fixed tables of glass under the blocks, which project beyond the table at the end of each stroke apparatus, and places such tables at each side of the course in which the polishing table traverses backwards and forwards, and with the upper surfaces of each of such fixed tables in the same plane as the upper surface of the glass. To prevent the faces of the polishing blocks from being frayed or injured by the edges of the glass, he fixes strips of hard material, having their edges rounded off along the whole length, placing the upper sides of such strips upon the same plane as that above mentioned.

CHAPMAN, G. *An improvement in socks, drawers, and other garments made of knitted fabrics.* Dated Jan. 29, 1858. (No. 163.)

This consists in working in, or introducing into, socks and knitted gloves, the legs of drawers, the arms of under shirts, and other knitted garments, threads of caoutchouc, to cause the parts to adhere to the leg or other part.

GOODWIN, J. *Improvements in the treatment, preparation, and cleansing of textile fabrics and materials.* Dated Jan. 29, 1858. (No. 167.)

Liquor is prepared by boiling coal, cinders, or other carbonaceous matter in water, adding chalk. The fabrics to be treated are boiled in this liquor. The prepared liquor answers also as a substitute for the "dunging" process used by calico printers and others.

NICOL, G. G. *Improvements in balls or projectiles.* (A communication.) Dated Jan. 30, 1858. (No. 170.)

Each ball or projectile is formed partly cylindrical and partly conical. The cylindrical portion fits the barrel, allowing as little space for windage as may be. The forward conical end is formed with grooves inclined to the longitudinal axis. One side of each groove is perpendicular to the axis, the other is curved. As the ball or projectile is propelled through the air, the pressure of the air on the upright side of each groove will cause it to rotate.

NOTICE OF APPLICATION FOR LEAVE TO FILE A DISCLAIMER AND MEMORANDUM OF ALTERATION.

PATENT LAW AMENDMENT ACT, 1852.

In the matter of Letters Patent granted to Robert Hanham Collyer, M.D., of No. 3, Park-road, Regent's-park, London, for "an improved mode of preparing the residue of beetroot, mangel wurtzel, and other species of the genus betd, left in sugar making and distillation, to be used as material in making paper, papier maché, millboard, and other similar manufactures." Dated 5th June, 1857. No. 1578.

Notice is hereby given, that the said Robert Hanham Collyer has applied by petition to the Commissioners of Patents, according to the statute in that case made and provided, for leave to enter a disclaimer and memorandum of alteration of certain parts of the specification of the said Letters Patent.

R. A. Brooman, 166, Fleet-street, London,
Agent for the Patentee.

PROVISIONAL PROTECTIONS.

Dated July 27, 1858.

1693. A. Taylor, of De Beauvoir Town, Kingsland. Improvements in pianofortes.

Dated August 4, 1858.

1773. C. M. Archer, of Haverstock-hill. Improvements in electric and submarine telegraph cables and wires.

Dated August 11, 1858.

1825. S. F. Cottam, of Manchester, machinist. Improvements in machinery for doubling cotton and other yarns or threads.

1827. J. B. Joyce, J. Cure, J. Boyes, and J. Clough, all of Bradford, York. Improvements in machinery or apparatus for combing wool and other fibrous materials.

1829. R. A. Brooman, of 166, Fleet-st., patent agent. Improvements in time-keepers. A communication from F. P. Vaglica, of Palermo.

Dated August 12, 1858.

1831. W. Meckel, of Friday-st., City. Improvements in textile fabrics.

1833. J. Scott, of Shoreham, commander in the mercantile marine, and A. Martinucci, of Brighton, gentleman. An improved steam engine.

1835. J. H. M. Maissiat, of Paris, chemist. Improvements in wheels.

1837. J. Fogg, of Great Lever, near Bolton, bookkeeper. Improvements in pressure gauges.

1839. A. J. Paterson, of Edinburgh, Esq. An improvement in propelling ships and vessels.

1841. E. Smith, of Tipton, Stafford. An improvement in puddling iron.

1843. H. Smith and T. W. Ashby, of Stamford, agricultural implement makers. Improvements applicable to haymaking machines, whereby such machines are rendered useful for other agricultural purposes.

Dated August 13, 1858.

1845. W. B. Nortcliffe, of Fellgrove, near Huddersfield, dyer. An improvement in dyeing woollen, worsted, cotton, silk, linen, and other textile fabrics and fibrous substances.

1847. F. J. Manceaux, of Paris, manufacturer. Improvements in stocks for fire-arms.

1849. T. Rickett, of Buckingham. Improvements in locomotive engines and other carriages to facilitate their transit.

1851. T. Worth, of Rochdale, wire-card maker, and H. Spencer, of the same place, agent. Improvements in machinery or apparatus for preparing for spinning, and for spinning cotton and other fibrous materials, in winding and warping yarns of the said materials, and in making wire cards for such preparing machinery.

1853. J. H. Johnson, of Lincoln's-inn-fields, gentleman. Improvements in the treatment of crude india rubber, gutta percha, or other vulcanizable gums, and in the manufacture therefrom of what are usually called hard rubber articles. A communication from G. Day.

Dated August 14, 1858.

1855. J. Cartmel, of Stamford-st., Surrey, hat manufacturer. Improvements in the manufacture of hats, caps, and other coverings for the head.

1857. J. Holt, of Shelf, near Halifax, York, mechanic. Improvements in looms.

1859. A. Slate, of Adelaide-road, Haverstock-hill. Improvements in blast furnaces and in smelting iron ore.

1861. C. O'Neill, of Manchester, manufacturing chemist. Improvements in the manufacture of artificial gums from starch, farina, and other amylaceous substances, and in apparatus for such manufacture.

1863. W. E. Newton, of Chancery-lane. An improved combination of metal with india rubber or gutta percha, or with india rubber or gutta percha combined with other substances, in the manufacture of belting, hose, valves, and other articles. A communication.

PATENT APPLIED FOR WITH COMPLETE SPECIFICATION.

1880. A. V. Pinta, of King William-st., City. Improvements in blank forms of cheques or drafts on bankers, payable on demand, relating to the crossing of such cheques or drafts. Dated 18th day of August, 1858.

NOTICES OF INTENTION TO PROCEED.

(From the "London Gazette," August 31st, 1858.)

836. F. C. Gilbert. "Purifying water-closets," &c.
851. W. H. Ridgway. "Covers of jugs."
860. J. Rawstorne. "Stopping ships."
879. B. Parker. "Permanent way."
880. W. Bishop. "Ticketing spools, sampling patterns, printing labels, affixing stamps and cutting their edges."
887. P. Maugey. "Optical instruments." Partly a communication.
892. J. B. Paddon. "Gas regulators."
898. H. J. Sillem. "Sugar."
907. R. Bodmer. "Removing sand from docks." A communication.
908. F. Lillywhite and J. Wisden. "Projecting cricket balls."
913. B. Burleigh and F. L. Danchell. "Filters."
913. J. M. Fisher. "Chimney tops."
916. J. Westerby. "Lubricating pistons."
920. J. Seaman. "Cultivating land."
921. W. Foster. "Vent peg."
922. E. E. Lee. "Ornamenting buttons," &c.
928. C. F. Vasserot. "Blast engines; pneumatic machines." A communication.
932. B. Drukker. "Shirts."
941. E. Tomlinson. "Cop tubes."
954. A. M. Perkins. "Steam engines."
955. C. Lawrence. "Steam engines."
957. W. Smith. "Spinning machinery." A communication.
958. W. Smith. "Steam ploughs." A communication.
981. J. A. Hartmann. "Printing cloth."
1113. W. MacNaught and W. R. Critchley. "Printing cylinders."
1122. J. Hesford. "Stretching machines."
1425. P. Griffiths. "Shaft couplings."
1497. T. Restell. "Fire-arms and ordnance; ammunition."
1570. J. A. Fussell. "Ornamenting chandeliers," &c.
1623. C. Reeves. "Fire-arms."
1659. L. J. Marks. "Compasses."
1688. H. Glover. "Measuring angles and taking altitudes."
1714. J. Brierley. "Spinning."
1724. H. Bessemer. "Treating pit coal."
1754. W. Taylor. "Iron."
1758. R. Cunningham. "Printing surfaces."
1763. J. Greenwood. "Steam boilers," &c.
1769. J. J. Russell. "Tubes."

The full Titles of the Patents in the above List can be ascertained by referring back to their numbers in the Lists of Provisional Protections previously published.

Opposition can be entered to the granting of a Patent to any of the parties in the above List who have given notice of their intention to proceed, within twenty-one days from the date of the Gazette in which the notice appears, by leaving at the Commissioners' office particulars in writing of the objection to the application.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

1921. C. Schlickeysen.	1954. C. Radcliffe.
1926. W. Brown.	1964. P. E. Charton.
1927. C. F. Stansbury.	1976. A. I. Austin.
1929. E. Carless.	2002. W. De la Rue.
1941. W. Johnson.	2005. W. Southwell.
1943. C. Esplin.	2026. J. Stewart.
1948. E. N. Fourdrinier.	2032. R. B. Feather.
	2232. F. C. Lepage.

LIST OF SEALED PATENTS.

Sealed August 27th, 1858.

391. L. Galli.
397. J. G. and W. M. Newey.
399. A. Von Schuttenbach.
401. J. K. Field.
403. H. M. Platt.
406. J. Billing.
407. J. Skelly.
408. J. Bircumshaw.
410. A. Ripley.
412. W. Hooper.
471. J. P. Budd.
493. F. A. Verdeil.
500. T. Thompson.
528. J. Hamilton, jun.
542. W. S. Clark.
545. T. C. Hine.
625. W. S. Clark.
631. F. Haeck.
667. E. A. Jacquin.
805. M. A. F. Mennons.
1034. A. V. Newton.
1291. A. Robertson.
1402. W. E. Newton.
1438. J. Taylor.
1499. J. Chisholm.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions.

NOTICE TO CORRESPONDENTS.

Articles and Correspondence designed for insertion in the ensuing Numbers of the *Mechanics' Magazine* must reach the Office by the Tuesday of each week, at the latest. It is highly desirable that they should be forwarded earlier if possible.

CONTENTS OF THIS NUMBER.

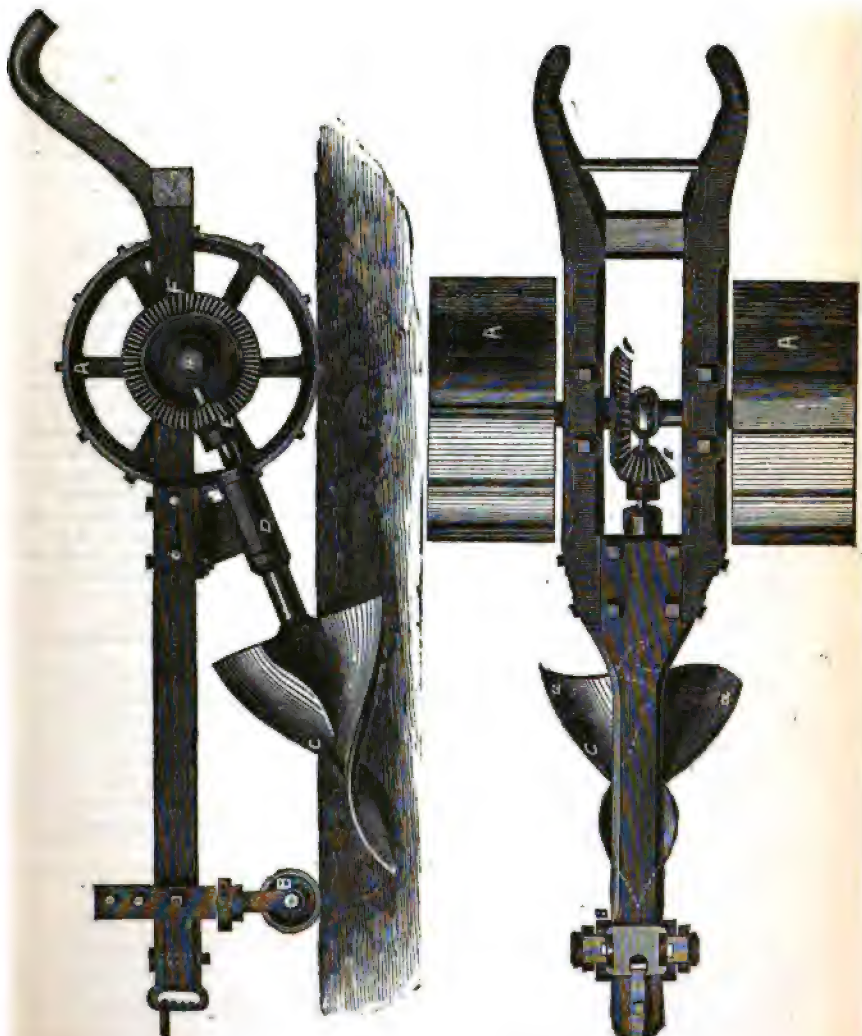
LONDON: Printed and Published by Richard Archibald Brooman, of 166, Fleet-street, in the City of London. Sold by A. and W. Galignani, Rue Vivienne, Paris; Hodges and Smith, Dublin; W. C. Campbell and Co., Hamburgh.

Mechanics' Magazine.

No. 1831.] SATURDAY, SEPTEMBER 11, 1858. [Price 3d.

Edited by R. A. Brooman and E. J. Reed, 166, Fleet-street, London, E.C.

PLATT'S PATENT PLOUGHING AND TILLING APPARATUS.



PLATT'S PATENT PLOUGHING AND TILLING APPARATUS.

Mr. Henry Mortimer Platt, of New York, has just completed a patent in this country for a novel form of ploughing and tilling apparatus, the object being to turn up the soil in a superior manner, and to pulverize it at one operation; the invention being designed to facilitate the employment of steam as a motive power as well as the power of men and animals. The principle consists in the use of a revolving screw-shaped share supported upon a wheeled carriage, and so coupled and geared to the wheels that as the machine advances the screw-shaped share will enter the ground, and be made at the same time to revolve with a certain velocity according as it is geared with the wheels, and also proportioned to the speed of the latter. As the furrow slice is lifted, it is at the same time so completely cross-cut by the revolving share as to effect its proper pulverization, whereby it is left fit for the immediate planting of seed, and the harrowing operation is thereby saved.

The apparatus is represented in the engravings on the preceding page. The cart frame is supported upon three wheels, A, A, two of which are the driving ones for revolving the ploughshare. These are broad-faced wheels with cross-ribs at short distances fixed upon them; these latter being for the purpose of securing the necessary grip or friction on the ground to cause them to turn the share. Combined with these is the third wheel, B, standing at the front end, or plough-beam, to which it is connected in such manner that the height of the latter from the ground may be varied according to the varying depths at which it is desired that the ploughing shall be done. The ploughshare or instrument for turning the furrow consists of two or more blades of metal, C, formed into a spiral or screw upon a shaft; this tapers to a point at its advancing end, and is so attached to the frame by its shaft as to incline toward the ground. The shaft passes through journal boxes, D, and has at its inner end, at E, a toothed pinion wheel which gears into a like wheel, F, upon the axle of the cart. The operation is as follows:—Having set the beam by elevating or lowering the third wheel, B, to give the depth at which the ploughing is to be done, and the machine being then drawn over the field, the ploughing will go on by a furrow being formed by the pointed end of the screw entering the ground in a slanting direction. As this advances a furrow slice will be raised up, sliding along and up the spiral blade of the screw; but, as the screw revolves at the same time that it advances, the ground is thrown out and is then cut or broken into fragments by the edges of its blades coming successively upon it before it has time to get clear of them. The screws may be made of several blades, thus forming two, three, or four threaded screws. The screw starts at its point as two-threaded, and near its upper and largest part it has two other blades, *a*, attached, so as to make it four-threaded at and near its rear end.

In ploughing so deep as to raise the subsoil the action is peculiarly advantageous; since that subsoil, instead of being thrown up so as to lie on the top of the earth which has been turned over, where it can come into contact with anything planted, to the injury thereof, is by these improvements completely subdivided and distributed so evenly throughout the mass as to do no injury, but, on the contrary, becomes rapidly assimilated therewith.

In ploughing by steam, a number of the screws can be arranged across one frame and be operated by a single pair of wheels, these latter being placed far enough apart to admit of the necessary geared wheels to act on the pinions of the ploughs. Variations in the shape of the screw-cutters are also contemplated, by which either greater depth with less width of furrow, or greater width with less proportionate depth, can be ploughed, according to circumstances.

Mr. R. Stephenson, M.P., on the Skill of Workmen.—Mr. R. Stephenson recently remarked at Newcastle that there are no members of society for whom he has a higher respect than for industrious and intelligent workmen. "It is to them," said he, "that the engineer is indebted for the full and efficient realization of his conceptions, which, however good they may be, must largely depend upon the skill of the workman for their success. The progress made in the higher branches of engineering during the last thirty years may be attributed, in a great degree, to the improved skill and intelligence of the workmen. The advance of mechanical science, and its application to useful purposes, must always go hand-in-hand with the skill and also with the comfort of the working classes. . . . . . . Reflection teaches us to feel that skilled labour is the great fulcrum upon which all our social progress depends, and that the success of this progress is just in proportion to the skill of the labour brought to bear upon the great works so thickly scattered throughout our country."

MR. FAIRBAIRN ON THE FLOATING CORN MILL FOR THE NAVY.

At a late meeting of the Institution of Mechanical Engineers at Newcastle, Mr. W. Fairbairn, of Manchester, supplied a paper on a floating steam corn mill and bakery for the Navy. The writer stated that, during the recent siege of Sebastopol, it was determined to effect an arrangement for supplying our troops daily with new bread and fresh flour from the grain of the surrounding country, by providing the means of converting the wheat into flour, and baking it upon the spot, by a floating mill and bakery. Having been consulted as to the best means of carrying out the object, the writer prepared drawings and plans of the proposed mills and apparatus, and two Government screw steamers, subsequently named the *Bruiser* and the *Abundance*, were purchased by the Government for the purpose, and fitted with the machinery by Messrs. William Fairbairn and Sons, the whole being completed in less than three months. The marine mill machinery was similar to that ordinarily employed on shore in this country, with only such modifications as were necessary to adapt it to its novel position, and fit it to sustain the constant and varying motion of the vessel at sea. All difficulties were overcome, and the mill answered admirably, grinding in almost all weathers at the rate of twenty bushels of flour per hour, and that at a time when the vessel was steaming at the rate of 7½ knots. Both the mill machinery and the ship were propelled by engines constructed by Messrs. Robert Stephenson and Co., of 80-horse power. While the vessel was in harbour in Balaklava the daily produce of flour was about 24,000 pounds, and that from very hard wheat full of small gravel, and consequently the more difficult to grind. It was originally intended to produce 20,000 pounds per diem, but proved capable of a considerably larger production, and not the least important of its good qualities was that it never got out of order during the whole period of its service in the Black Sea. The experiment forcibly suggested the necessity of a light portable steam engine and mill for grain being constantly attached to the camp whenever an army took to the field. This could be done at a very moderate cost, and, in the writer's opinion, no army should attempt to take the field without it. The whole affair would not exceed the weight of a heavy-sized gun, such as now accompanied our armies. There was no practical difficulty in the way of introducing an engine capable of supplying newly-baked bread from an oven constructed in the smoke-box of a portable locomotive engine mounted on wheels and prepared with grinding apparatus at the same time. The results of the working of the corn mill, as given in the official reports, were twenty tons of flour per day of twenty-four hours, in constant full work, and 18,000lbs. of bread, in 4lb. loaves, were produced daily from the bakery. This rate of work was continued uninterruptedly for many months, and the machinery answered completely the object intended. The total quantity of bread produced in three months, from 1st January to 31st March, 1856, was 1,284,747lbs., and the expense of working was £2,017, or 3s. 2d. per 100lbs. for manufacturing, including the expense of a sea establishment for the vessel, which would not be required where the vessel was stationary. The quantity of flour ground in the same period was 1,331,792lbs., with 358,172lbs. of bran, the wheat supplied being 1,776,780lbs. The expense of working was £2,050, or 3s. 1d. per 100lbs. of wheat ground. The total cost of flour produced was about 25s. 3d. per 100lbs. The wheat cost about 18s. per 100lbs., or, the value of the bran being taken at 7s. per 100lbs., less than a penny per pound. The grinding was performed satisfactorily even in a heavy sea, and was done by the mere power which propelled the vessel. On one occasion, when the vessel was steaming six and a-half knots per hour, ten sacks of 168lbs. each were ground per diem, and the mill was continued in constant work for thirty-five hours, the men being divided into watches of four hours.

The paper was explained by diagrams, and a confident opinion was expressed that, if the mill had been in operation at the early part of the siege instead of only at the end, many valuable lives would have been saved.

Mr. Anderson observed, that the greater part of the work of these floating bakeries had been supplied by Messrs. Smith, shipbuilders, of the Tyne; the engines were supplied by Messrs. Morrison, and amongst the people employed were several from Newcastle. He said that nothing had done better service than this floating factory. Mr. Haswell also made some observations to the same effect, and the discussion closed by a vote of thanks being passed to Mr. Fairbairn for his interesting paper.

Railway Station Names.—It has been suggested that the railway employés at each station should bear the name of the station on their hats and caps, in the hope that this may compensate for the change those names usually undergo in the men's mouths after frequent repetition. We cordially concur in the suggestion, and believe it would be an effectual method of frustrating the constant efforts which railway porters apparently make to call out any other sounds than the right ones.

ON THE MANUFACTURE OF STEEL BY THE UCHATIUS PROCESS.

A paper on the above subject, written by Mr. T. Spencer, of the Newburn Steel Works, near Newcastle, and giving a more complete and satisfactory account of the Uchatius process than has hitherto appeared, was read at the Newcastle meeting of the Institution of Mechanical Engineers. The paper in the outset adverted to the importance of the quality of the materials used for tools and machinery being good, and, after dwelling upon the nature of cast steel, proceeded to describe the Uchatius process:—The principle on which the Uchatius process is based is to take away as much carbon only as is required to produce steel, and to abstract at the same time the impurities from the iron. The first and most important of these objects is effected by bringing a certain measured quantity of oxygen (in the shape of oxides of iron) in contact with the cast iron, so that while the iron is hot the oxygen combines with the carbon and flies off in the form of carbonic acid gas. The purification of the cast iron from silica, sulphur, magnesia, &c., is effected by bringing the iron when it is in a melted state into contact with alkaline earths, so that the impurities combine with them and remain floating on the top of the fluid metal. In order to effect these two operations at the same time, the pig iron is melted in a furnace, or ordinary founding cupola, and runs into cold water, which reduces it into small granules. This granulated iron is mixed with pulverized oxide of iron and some alkaline earths, and the whole is put into the ordinary steel-melting crucibles, and placed in the furnaces, and brought into a fluid state. The degree of hardness of the steel is thus capable of being regulated by the size of the granules, and by the quantity of oxides used. The oxides employed for this purpose are iron ores of the finest quality, such as spathose and hematite, which are to be previously calcined and pulverized, and the proportion to the granulated iron is according to the hardness of steel required, say from 20 to 30 per cent. The more ores that are employed the greater the decarbonization, and consequently the softer will be the steel produced. The chemical process which goes on in the crucibles is this:—When the ore gets hot, the oxygen yielded by the ores combines with the carbon contained in the iron, and the latter flies off as carbonic acid gas, which proceeds until the heat becomes so great that the granules melt and fall by their own gravity to the bottom of the crucible, and at the same time the earths contained in the ores melt and swim upon the top of the melted iron in the form of scoria; each granule or drop of melted metal has, therefore, when it falls, to pass through the scoria, and it is in the passing through that the combination of the alkaline earths and the impurities of the metal takes place, so that only the purified and decarbonized drop of iron falls down to the bottom of the crucible. The operation in the crucible will be, that, each granule being surrounded or enveloped with the pulverized oxides, &c., the decarbonization takes place first on the outside of each granule, and so progresses as the heat gets greater, towards the centre; if, therefore, during the process the granule could be examined, it would be found that the outside is entirely deprived of its carbon, the part of the granule lying next to the outside would be partially decarbonized, and the middle or centre would not be decarbonized at all. Each granule would, therefore, be composed of pure wrought iron, steel, and cast iron. By increasing the heat the cast-iron portion of the granule first becomes fluid, and the granule bursts and falls down to the bottom of the crucible, cleansing itself in passing through the scoria. The heat, continuing to increase, then melts the outside shells of the granules until all is one fluid mass in the crucible, when they are ready for being poured into the ingot moulds. The iron contained in the oxides mixes at the same time with the fluid mass, and yields about six per cent. more of cast steel than the weight of granules put into the crucible. The advantages, therefore, of this process are, 1. A very rapid manufacture of cast steel, as the pig iron can be turned into cast steel in the space of a few hours. 2. Certainty in producing a uniform quality of steel—that is, a steel containing a certain proportion of carbon, which is accurately determined by the weight of oxide before mixing with the granules. 3. Less cost than the ordinary methods of cast steel making, as the processes are fewer and the materials used are pig iron and iron ores. The writer stated, in conclusion, that the processes above described were those according to which the experiments which he had made at the Newburn Steel Works had been conducted.

Specimens of sheet and bar steel manufactured by this process were exhibited, and a discussion ensued in which Mr. Fairbairn said this paper appeared to raise a very important question in the manufacture of steel. They were in a transition state with regard to the principle of manufacturing steel, and they might look forward to very great improvements, not only in the manufacture of steel, but also of iron. Mr. Bessemer and others in Sheffield were making steel plates of a very high order, and he learned from Mr. Spencer's paper

that a bar of steel an inch square sustained nearly three times the weight sustained by iron of the same description. He had no doubt that, when the attention of gentlemen connected with the iron manufacture of the country was directed to it, they would have plates that would be perfectly homogeneous, and be at least double the strength of iron plates. If metal of this sort could be obtained at a moderate cost, and used in boiler construction in plates of one-half the present thickness, they would attain a very important desideratum. Now that steam was being used at such high pressure, it was very important that they should have materials that could be depended upon, and he hoped the results would be satisfactory to the community at large.

Mr. Spencer, in answer to a question, said the iron he used was obtained from Sweden, which was well known to be the best for all purposes, and that the price of the material made by this process would be about £25 per ton.

SIR CHARLES T. BRIGHT ON THE ATLANTIC TELEGRAPH.*

The following is a slightly condensed report of the very graceful speech made by Sir C. T. Bright, the engineer of the Atlantic Telegraph Company, at a banquet given in his honour by the Lord Mayor of Dublin. (We cannot avoid remarking that this banquet would have been infinitely more worthy than it proved, but for the ostentatious presence of a Cardinal of that Church which has in past ages done its worst to quench the torch of science. That national progress of which the Atlantic Telegraph is the latest and grandest step is the product of our anti-Roman Catholicism, and he must be dull indeed who fails to appreciate that fact, despite the liberal professions which Cardinal Wiseman may find it politic to make. His prominence at the Dublin meeting was, therefore, utterly indefensible.)

Sir Charles said :—I cannot but be personally gratified to the utmost degree at the manner in which I have been associated with this demonstration, as an instrument in the carrying into effect of the great work which has been recently completed; but I am sensible, in the contemplation of our success and its result, of the presence of those higher and comprehensive considerations which must be felt by us all; and I assure you that the undertaking was originally projected with nobler views than could be excited by any motive of making money or fame by its accomplishment, and the part which I have taken in it inspires in my mind very different feelings to those of pride and self-glorification. I cannot take to myself all that our host has been good enough to say concerning me, but I must do my best to approach such a standard as he has pictured. In the position which I have occupied as engineer to the Atlantic Telegraph Company, I have had the most valuable co-operation and assistance from Mr. Canning, Mr. Whitehouse, Mr. Everett, Mr. Clifford, and all the members of the engineering staff whose names are now familiar to you all, and I very much regret that they cannot be here to thank you for the festive honours which you would, I am sure, have bestowed upon them. I have one feeling of satisfaction in our commemoration, which even exceeds the individual satisfaction the Lord Mayor's hospitality and your kindness afford. We have especial reasons in these islands for some degree of pride in regard to the achievement which is at this moment being celebrated in New York as well as here; for, although its consummation has been shared by the other great branch of the Anglo-Saxon race with us, yet the birth of the electric telegraph, and the further invention of the submarine telegraph, is due to our fellow-countrymen, whose names should be remembered by every one who values our pre-eminence and the advancement of science and civilization. Messrs. Cooke and Wheatstone patented in England in 1837 the first telegraph which assumed a practical form. A mode of communicating signs through wires had been known for some years at lecture tables for the instruction and entertainment of classes; but it is probable that the electric telegraph would have been devoted to such employment only for some time but for the enterprise, science, and perseverance of Mr. Cooke. In June, 1839, he completed his first line of telegraph from London to Drayton, and after this the system was gradually extended throughout Great Britain; but it was not until later that the other states in the Old and New World availed themselves of the example which had been set in this country. The first line in America was laid between Washington and Baltimore, by a subsidy from Congress, in 1843. The submarine telegraph, the latest and most valuable development of telegraphic art, also derives its birth and practical form from our country's genius and skill. In 1850 an experimental line was laid between Dover and Calais, which

* From the *Times* the public has learnt that Sir C. T. Bright was knighted on Saturday last by the Lord Lieutenant of Ireland. When our announcement of the intended promotion appeared, our accuracy was doubted by some; but only, we presume, because we were the first Editors to whom the news was communicated.—Eds. M. M.

was followed in 1851 by the submersion of a conductor, protected by iron wires laid spirally round it, to afford a greater degree of strength and protection. This line was projected by Mr. Brett, to whose energy its establishment is chiefly due, and laid by Mr. Crampton, one of the most eminent of our English engineers. After this, wires were made in England and laid by Englishmen in every direction between Ireland and Scotland (in connection with which I may say that it is exactly six years since I sent the first message to the shores of Great Britain), to the Hague, Belgium, in the Mediterranean, and across the Gulf of St. Lawrence. The idea of laying a cable to unite Europe with America naturally arose from the establishment of these lines, and it would not be an easy or a pleasing task to endeavour to select any individual name on which to place the honour of originating the great enterprise whose triumph we are now celebrating. I have laboured in its interests for a long time; and I would take this opportunity of stating, in reference to a part of the work which has generally been ascribed to me, that I disclaim the suggestion of it, though I have advocated it strongly. I mean the mode of starting from the middle. In 1853, shortly after the laying of the line of the Magnetic Telegraph Company between Portpatrick and Donaghadee, I was speaking with Captain Harves, R.N., who had given considerable assistance in directing the course of the cable in regard to the Atlantic line, about which I was then occupying myself, and he advised that we should commence from the middle in the manner we did. There is one very curious circumstance which I may mention in connection with the telegraph science and an eminent statesman who recently visited this country, Lord Palmerston, the late Prime Minister. At a meeting of the British Association in Southampton, in the year 1843, when an explanation was given of the first working telegraph which had been laid down by Mr. Cooke, some merriment was occasioned by a remark of Lord Palmerston, to the effect that he should not wonder if the time came when the Prime Minister of the day might be asked in the House of Commons whether a war had not broken out in India? and the minister would reply, "Wait until I telegraph to the Governor-General on the subject." This, which was regarded at the time as a very lively joke, but not coming within the region of probabilities, is now almost a reality; for there can be little doubt that telegraphic communication with Calcutta by means of the Red Sea route will be established in the course of next year. I have obtained the leave of the Lord Mayor to propose a toast, which I venture to engage that you will receive with as much warmth as you were good enough to show when my health was proposed. There must be in all undertakings a man of business, and many great plans have fallen through for want of that system which large commercial experience can alone teach. None of the first projectors of that line, among whom I have the honour to include myself, had that experience; and to Mr. Field, although he did not take part in the practical carrying out of the work, there is due a very great share of the credit arising from the success of the enterprise; and it must be said in all truth that, but for his wonderful energy and capability in the negotiations and other matters which he took in hand, the line to America could not have been in existence as soon as it is. I met Mr. Field also for the first time in 1855; he was then in England as the representative of the Telegraph Company between New York and Newfoundland, in connection with which Mr. Brett had undertaken to cause a line to be laid across the Atlantic. The means were, however, wanting for the carrying out of this arrangement, the notion of a conductor being laid across the Atlantic not being favoured with the air of popular favour on either side of the ocean. . In the year following I entered into partnership with Mr. Field, Mr. Brett, and Mr. Whitehouse, who had been previously joined with us in electrical experiments in regard to certain conditions of an Atlantic line; and we set to work at once in earnest for the formation of a company. Some of my friends at Liverpool and in the north country, who had faith in the result of what I took in hand, subscribed largely to it. The rest of our work you know—the construction of the cable, its shipment, and our final success. I would that there had been some one more competent, and yet equally acquainted with the merits of Mr. Field, to do justice to those high and estimable qualities—to that energy and activity of mind which have been so ably exerted by him in this cause. But I have said enough to show that to forget the great part which he has taken in the formation of this noble enterprise would be as ungenerous and ungracious as if we could imagine our friends in America, who are at this moment celebrating our triumph, passing over some of us on this side who have contributed to our success, and forgetting the degree of share which British capital, experience, and skill, and the aid which the British Government have afforded, have had in carrying out the undertaking. I therefore propose "the health of Mr. Field and the American officers who have aided in the enterprise," and beg to thank you again for your kindness towards myself.

THE ATLANTIC TELEGRAPH.

The public feeling was much damped on Monday last by the announcement that no satisfactory signals had been transmitted through the Atlantic cable since the preceding Friday. The probable cause of this apparently threatening evil was next day made public by Mr. Whitehouse, the late electrician of the Atlantic Company, between whom and the directors a split has taken place. The following is Mr. Whitehouse's statement:—

"As early as the fourth day after the landing of the cable at Valentia, I felt it my duty to urge in the strongest manner upon the directors the immediate necessity for protecting the home end of our light and fragile cable, warning them of impending injury, and of the certain interruption of communication which would ensue therefrom. Of this no notice was taken by the directors.

"A few days later I again brought the subject to their attention in the most forcible manner, both by post and telegraph. The injury which I had foreseen, and of which I had forewarned them, had then commenced close to the shore; I had detected and proved its existence, and for some considerable time all communication hence to Newfoundland ceased, though from obvious causes their signals to us were not equally embarrassed.

"Left in responsible charge of the Valentia station, without support or advice, without assistance of the engineer, and without the presence of a single director, I took upon myself the onus of raising and repairing the faulty part of the cable, which was easily accessible; free inter-communication was thus re-established, and early the next morning the President's reply to Her Majesty's message, which had been long waiting at Newfoundland, was transmitted from that station by the use of my instruments (carried out by the *Niagara*), and was received at Valentia and recorded under my own patent. I then again, in language as forcible as I could command, declared to the directors my conviction that this interruption might be expected to occur again at any time, and that we could not depend upon our cable for a single day so long as the slender part, prepared and fitted for deep-sea use only, remained unprotected and exposed to the full force of the Atlantic swell on the Irish coast. I also felt it my duty to point out, in unmistakable language, the necessity for the presence of some part of the executive body at the seat of operations.

"Up to this period, the fourteenth day after the landing of the cable, neither chairman, vice-chairman, director, nor secretary had visited Valentia, Professor Thompson, who had most handsomely supplied my place during the expedition (which I was peremptorily forbidden by my physician to join), and also Mr. Bright, who had both landed there from the *Agamemnon*, having left, the one very shortly for London, the other a day or two afterwards for Glasgow.

"The whole of the details connected with this subject will probably ere long be laid by me before the public. Suffice it here to say, that, intimately connected as I have been with the first and every electrical operation or communication night and day between the two countries (as, indeed, they had been wholly under my direction), my name seems to have been on all occasions studiously suppressed, while my most earnest wishes for the welfare of the undertaking have been misunderstood and my actions condemned without inquiry.

"My duties as electrician-projector of the Atlantic Telegraph (my medical adviser having, as I have just stated, positively prohibited my joining the expedition) had been fulfilled, when I had demonstrated to the world by the use of my own instruments, after years of anxious toil, in spite of most grave doubts entertained by some of the highest scientific authorities of our day, the fact of the transmission of intelligence through the submerged cable between Europe and America with absolute accuracy, and at a speed sufficient, under good management, to ensure a brilliant commercial success to those who had hazarded their capital in the enterprise.

"With this consciousness I now looked for a well-earned and honourable repose from the more pressing official details of my position, as indeed the terms of my agreement with the company had allowed. Instead of this I received from the hands of one of the directors an extract from the minutes of a recent Board, drawing my attention to the fact 'that my engagement as electrician of the company terminated when the cable was laid,' and intimating to me that 'my authority as an officer of the company had now ceased,' this being conveyed in such terms and in such a manner as to amount in fact to a summary dismissal.

"A fortnight has elapsed since I claimed, as a matter of justice, a full and complete investigation, towards which I am not aware that any steps have yet been taken. The Board, having summoned me to London to dismiss me, have now found it necessary to adjourn to Valentia.

"The obstruction to the interchange of messages to which I have already alluded, and the recurrence of which the directors

had every reason, from my reports, to expect, has now, apparently, again manifested itself.

"I think it right, therefore, towards the public and the shareholders, no less than as a duty to myself, to state that the probability of this recurrence of injury had been anticipated and predicted by me with the utmost confidence, with a view to its prevention. There is, I apprehend, little real cause for anxiety, nor is there necessarily, so far as I am at present aware (for I know no details but those which your pages offer), anything in this obstruction calculated to damp the most sanguine hopes of ultimate complete success. It is apparently no more than a repetition, from continued exposure to the same causes, of the fault or injury already once removed and which ought by this time, so far as human means admit, to have been prevented or rendered impossible.

"EDW. ORANGE WILDMAN WHITEHOUSE,

"Electrician-Projector, and one of the Four Original Promoters of the Atlantic Telegraph.

"**Royal Institution, Albemarle-street, Sept. 6.**"

The Permanent Way and Coal-burning Locomotive Boilers of European Railways; with a Comparison of the Working Economy of European and American Lines, and the Principles upon which Improvement must proceed. By ZERAH COLBURN and ALEXANDER L. HOLLEY. With Fifty-one Engraved Plates by J. Bien. New York: Holley and Colburn. 1858.

THOSE of our readers who are acquainted with the American literature of practical science already know Mr. Zerah Colburn, one of the authors of this work, for to that literature he has contributed largely, and his contributions have usually been remarkable for their practical value. This fact is an earnest of the merit of the volume before us, the substance of which was first brought together as a private report to a few railway companies. On its completion the authors were requested to publish it; but before doing so they re-wrote and extended the manuscript portion, with the desire of making the whole more useful.

The subjects considered in this volume —Permanent Way and Locomotives—represent together about three-fourths of the total cost of the railways of America. The Maintenance of Way, together with Fuel, Repairs of Engines, and Attendance upon Engines, form one-half to five-eighths of the total working expenses. In comparing the American Railways with those of Europe in these respects, the authors, in their Introduction, make the following instructive observations:—

"We find that, while the first cost of the roadbed and superstructure (permanent way) of those of the latter (Europe) is but little greater, their expenses per mile run, for maintenance of way, is but *two-fifths* that in this country (America), while their consumption of fuel for equal mileage is less than 60 per cent. of the quantity burned in our locomotives.

"The railways of this country are operated at an annual expense of 120,000,000 dollars. The cost of operating the English railways for the same mileage is but 80,000,000 dollars—the difference alone being nearly equal to the annual production of the gold mines of California. The expense of maintenance of American lines, is from 31,000,000 to 35,000,000 dollars annually. That of English lines for the same mileage, 12,500,000 dollars difference—say, 20,000,000 dollars annually. The cost of fuel for the former is 18,000,000 dollars yearly; that of the latter for the same mileage is but 7,500,000 dollars, or 10,500,000 dollars against our system.

"The circumstances affecting English railway working are easily estimated, excepting that of climate, the comparative effects of which, in the two countries, must be a matter of judgment. The loads are 20 per cent. lighter on English railways (the percentage of fixed charges being thus greater), the speeds 25 per cent. higher; prices average 20 per cent. less for the usual items of materials employed in repairs. The English lines do not have the great advantage commonly supposed in respect to easy grades, and, as the expenses are reduced to a standard of so much per mile run, the effects of grades are shown rather by increasing the number of miles run to effect a given amount of tonnage, than in increased cost for each mile run. In alluding to fuel, we consider quantities only; but in respect to prices the difference is still more in favour of English railways, very few paying more than six cents per mile run for fuel.

"Equating all these circumstances, there remains a large economy in the working of English lines which can only be explained by referring to their engineering and physical condition. It is very common to attribute *all* examples of economy to 'management,' implying thereby organization, discipline, retrenchment, devotion, integrity, and business talent. These are of the greatest importance, but in none of these respects are English railways managed greatly different from those of this country, excepting that the former have, in

nearly all cases, a responsible engineering head, permanently retained in the service. But in character and quality of structure, English lines are materially different from those of America."

The authors inquire boldly into the causes of these discrepancies between English and American railways, and very honestly confess that they spring from a lack of professional self-respect, and, as a consequence, a want of professional status among American railway engineers. Here engineering is a profession,—and a very respected and profitable one. But in America, although there is no want of natural ability, as we well know, there is a want of solid character and purpose which works much mischief. The present is supreme; the future is sacrificed. Quantity is demanded; quality is lost sight of. A mere tyro, speculator, or even a charlatan, who will undertake to do a good deal of work for a little money, cuts out the educated and practised engineer, and gets the contract. Thus the profession is debased; for true and able men must either starve, or lower their demands and fall into the bad track. Nay, it is even worse than this; for these gentlemen, who would not state the case too severely against their countrymen, tell us that very few engineers, however able, have constructed more than one line of railway. Each new line has its own chief, "born to the occasion," who devotes himself to office and field routine, while "the president of the concern dictates the proportion of earthworks, the shape and quality of rails, and the selection of machinery and material!" The consequence is, the earthworks are insufficient, the drainage imperfect, the sleepers perishable, the rails weak, the joints loose, the expenditure of fuel extravagant, and hence the cost of maintenance and working is constantly on the increase.

Now the work before us has the very noble object of introducing or promoting the reform of these great evils, and this object the authors have sought to obtain by examining the facts of English and foreign practice, and tracing those features which may be advantageously imitated, and those also which should be avoided. For this reason their work is primarily of interest to Americans; but, in other respects, it will prove of immense value to English engineers, as will partly appear from the following statement of its contents.

The first chapter is an elaborate statement of the comparative working of European and American lines, including records of earnings and expenses, consumptions of fuel, loads, speeds, grades, climates and soils, prices, parliamentary expenses, land purchases and compensations, physical features, tunnels, earthworks, bridges, stations, equipments, &c. The second chapter treats in detail of earthworks and drainage, the third of ballast, the fourth of sleepers, the fifth of rails, and the sixth of rail joints; the seventh is a chapter of general conclusions. These seven chapters constitute the first part of the volume—that on permanent way. The second part—on coal-burning locomotive boilers—treats in the first chapter of English and American coal, in the second of combustion of coal, in the third of the coal-burning boiler of the London and South-Western Railway, the fourth of McConnell's boiler, and the fifth of coal-burning boilers with inclined grate; the sixth is a chapter of general conclusions upon the subject. In an appendix, further information is afforded respecting creosoting sleepers, Burleigh's patent switches and crossings, and coal-burning boilers for the East Lancashire Railway.

The general conclusions at which the authors arrive in respect to the permanent way are that the economy of European railways, as compared with the American, is confined exclusively to the permanent way, the machinery, and the working (from which, of course, all considerations which affect the projection of new lines, dividends, and other items of management, in which we have unhappily so little to boast of, are excluded). "Less labour is expended upon the track for a given mileage, the sleepers and rails have double the duration under a given rate of service, and but one-half the quantity of fuel is burned, per mile run, on the railways of Great Britain and France, as compared with those of the northern United States." The authors ably analyse the circumstances on which this economy is founded, under the heads of earthwork, drainage, ballast, sleepers, rails, and rail-joints. The only remark we shall here make upon these subjects is, that while the rails and rail-joints examined and described are very numerous, no mention is made of the admirable combined cast and wrought iron chairs of Messrs. Fenton, Thompson, and Snowden, which are described in the *Mechanics' Magazine* for 20th March last, and which are in use on the Lancashire and Yorkshire Railway. But this the authors had not, probably, seen when they went to press with this volume.

In their chapters on coal-burning locomotives, Messrs. Colburn and Holley do justice to the untiring labours and unrivalled skill of Mr. Charles Wye Williams, in the matter of furnace construction. They very wisely contend that no proper form of furnace can be expected to result from any efforts of inventors unless they first en-

lighten themselves by studying the chemistry of combustion, upon which they give a very carefully written chapter. Their notices and descriptions of English coal-burning locomotives are admirable, and they sum up this highly important question in a chapter in which a certain class of inventors and patentees are very properly not spared, and in which the principal improvements available in the American locomotive are noticed. This chapter we may hereafter extract for the benefit of our readers.

We have thus made a few observations indicative of the character of this well-conceived, well-written, well-prepared, and very comprehensive work, — enough, we hope, to commend it to every railway engineer and every student of railway engineering; but nothing but the possession of it will enable a person to thoroughly appreciate its great merits. It is both in design and execution a really magnificent volume, and, for the sake of our young engineers in particular, we wish it a very extensive circulation.

As many will, we hope, be inclined to purchase it, and as, unfortunately, no English publisher's name is on the title-page, we will endeavour, before concluding, to convey a knowledge of its superficial characteristics. It is, then, about 14 ins. by 10 ins., and 1¼ ins. thick, well and firmly bound, printed upon excellent paper, and with equally excellent type. It comprises an introduction of 11 pages, 168 pages of subsequent letter-press, and about 50 engraved plates, all of which are most carefully and successfully executed. These plates consist of representations of numerous American, English, French, Swedish, and other rails, drawn in section to the full size; others of several coal-burning (English) locomotives; others of railway earthworks and drainage arrangements; together with maps, &c.

Mr. W. Fairbairn on Himself.—Mr. W. Fairbairn, the eminent engineer, stated at Newcastle lately, that, although he was not himself a native of Newcastle, he owed almost everything to Newcastle. He got the rudiments of his education there, such as it was, and that was—something like their revered predecessor, George Stephenson—in a coal pit. He was brought up as an engineer at the Percy Main Colliery. He was there seven years, and if it had not been for the opportunities he had there, together with a library at North Shields, he believed he would not have been there to address them. Being self-taught, but with some little ambition, and a determined energy to go on, he now stood before them with some pretensions to mechanical knowledge, and, though he was not so vain as to think he did not know his own powers, he thought he had contributed a little to practical science, and to other objects connected with mechanical engineering.

Hand-Book of Chemistry, Theoretical, Practical, and Technical. By F. A. Abel and C. L. Bloxham. Second Edition. John Churchill, New Burlington-street.

We have much pleasure in recommending this work to the notice of those of our readers who may not have perused the first edition. This latter we have frequently referred to with pleasure and profit; for the style is both fluent and concise, and the careful arrangement and completeness of the work render it most useful as a hand-book. In no department of knowledge, however, is there so great a necessity for frequent revision, addition, and alteration as in that of chemistry. So long as we require a complete text-book of this science, we shall require either new works or treatises constantly kept up to the existing state of chemical information, and conforming to every advance of theory and improvement of nomenclature and notation. We are therefore glad to observe several improvements and additions in the Hand-Book of Chemistry by Messrs. Abel and Bloxham. Some few necessary alterations in the system of Qualitative Analysis have been made in accordance with the principle enunciated in the preface to the first edition, viz., that "analytical tables must ever be regarded as provisional, and will constantly be liable to be suspended by others which are less circuitous or more accurate." In Quantitative Analysis the volumetic system of examination lately perfected by Mohr, and extensively adopted in practical laboratories, is described, and some additional "Examples for Practice" have been added. The detail of several manufacturing processes has also been considerably improved.

In the chemical notation the old and generally received system, in which the adoption of hypothetic radicles is not required, has been of course adopted. The binary theory of acids (p. 168) and Gerhardt's system are, however, fully described, and the latter insisted upon with respect to the bibasic composition of sulphuric and carbonic acids, &c. With regard to this system it is observed, that, although "its general introduction, where chemistry is brought to bear upon practice, is much retarded by the necessity which it involves of totally altering the aspect of many familiar formulæ," yet, "the advantages of its application to some of the complex compounds of organic chemistry are very considerable, and, since the formulæ of these bodies have not taken quite so deep a root as those of inorganic substances, the new system of notation will probably be more generally used in that division of the science."

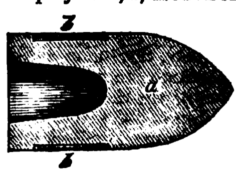
As might be expected from the nature of the opportunities possessed by at least one of the authors, many of the details of practical science are peculiarly valuable, containing in a few words the results of a long and extensive acquaintance with the processes treated of. On the score of typography, paper, &c., this work, like all others we have known published by Mr. Churchill, leaves nothing to be desired.

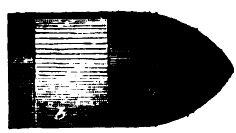
MR. ROBERT STEPHENSON, M.P., ON CIVIL AND MECHANICAL ENGINEERS.

In a recent speech at Newcastle, Mr. Robert Stephenson, M.P., spoke as follows: Having been brought up originally a mechanical engineer, and having seen as much as any one perhaps of the other branch of the profession as well, he had always observed that the civil engineering department was founded on the mechanical knowledge obtained in the workshop, and the further his experience advanced, the more he was convinced that it was necessary to educate an engineer in the shop. That education, he was satisfied, it was which rendered those who would succeed as engineers most intelligent, most useful, and full of resources in difficulty. It had been sought to draw a line of distinction between the civil and mechanical engineer; that distinction, however, was becoming more and more narrowed, and would very shortly be entirely obliterated. What was the distinction to be made between the conception of a piece of mechanism and its completion? There was not one single material brought to bear either in the execution or working of these great roads, in which they so much gloried, that had not mechanical skill applied to it as indispensable to its being brought there. There was the iron—what mechanical skill, did they not know, was required, not only in producing it from the mine, but rolling it, and moulding and forming it into all shapes? The success of railways, as they all remembered his father to have said, depended entirely on the success of the locomotive engine; the railway without the locomotive, or the locomotive without the railway, was of no value, it was the combination of both that brought about the grand result we every day witnessed; and what had produced the whole but mechanical skill? When he looked back upon the locomotive in its childhood—when he looked back at the efforts made, not by himself only, but many of his early friends, he was often struck with astonishment at the apparent absurdity, or rather the apparent complexity—the complex way in which they then endeavoured to accomplish a simple result. What they produced was indeed surprising, but it seemed to him that they never did go to work as they ought to do. They accomplished the work, but went about it in a complex way, and it seemed to him that no effort was higher for the engineer to aim at than to simplify a complex machine. The result as seen in the locomotive at present was not the work of one man, it was the result of the efforts of a whole nation of mechanical engineers. It was a combination of minds that had brought about these splendid results that we were every day and every hour witnessing. He was sure that no one felt more deeply than he did, in carrying out the great works from time to time entrusted to him, that he was dependent, not on his own resources, but upon the intelligence and the resources of those by whom he was surrounded. He could never have attained any position such as that he had had the good fortune to attain without the assistance of many others; and no man felt more than he did that no individual could accomplish any great result unless supported by the efforts of his friends and associates.

CAPTAIN NORTON'S NEW PATENT PROJECTILE.

That able and persevering officer, Captain J. Norton, whose mind, time, and purse are constantly devoted to the service of either the profession or the public, has just brought forward a new invention of very great promise. It is intended to prevent the leading of the barrels of small arms, and also to protect the barrels of ordnance. It consists in surrounding the lead ball or projectile, *a*, used in small arms





by paper, leather, skin, or other like suitable material as at *b*, and this by casting, or by compressing (or both) the projectile into the paper, leather, &c. The paper is first pressed or placed in the mould so as to surround those parts of the finished pro-

jectile which would come in contact with the barrel. The lead is then poured in. When taken from the mould, the projectile has a protective coating which will effectually prevent leading of the barrels.

For ordnance the patentee forms a jacket or skin of thin copper, or other suitable metal, and fills it with artificial stone, cement, or other suitable hard material.

BRITISH PATENTS IN 1857.

The Commissioners of Patents appointed under the Patent Law Amendment Act, 1852, in compliance with the terms of the third section of that Act, have made their report for 1857, from which we condense the following information.

The number of applications for provisional protection recorded within the year 1857 was 3,200; the number of patents passed thereon was 2,028; the number of specifications filed in pursuance thereof was 1,976; the number of applications lapsed or forfeited, the applicants having neglected to proceed for their patents within the six months of provisional protection, was 1,172.

The number of applications recorded within the first six months of the current year (1858) was 1,474; therefore, estimating the total number for the year at about 3,000, a decrease of about 200 on the whole year, as compared to the number of the year 1857, may be expected.

The Act. 16 Vict., c. 5, enacts that all Letters Patent for inventions to be granted under the provisions of the Patent Law Amendment Act, 1852, shall be made subject to the condition that the same shall be void at the expiration of three years and seven years respectively from the date thereof, unless there be paid, before the expiration of the said three years and seven years respectively, the stamp duties in the schedule thereunto annexed, viz., £50 at the expiration of the third year, and £100 at the expiration of the seventh year.

One thousand nine hundred and thirty-one patents bear date between the 1st July, 1854, and the 30th June, 1855; the additional stamp duty of £50 has been paid on 502 of that number; and 1,429 have become void by reason of nonpayment.

All the provisional, complete, and final specifications filed in the office upon the patents granted under the Act have been printed and published in continuation, with lithographic outline copies of the drawings accompanying the same, and within three weeks of the respective dates of filing, according to the provisions of the Act 16 & 17 Vict., c. 115.

The provisional specifications filed in the office and lapsed and forfeited have also been printed and published in continuation.

The work of printing the specifications of patents enrolled in Chancery previous to the Patent Law Amendment Act (1852), 12,977 in number, the first dating October, 1711, was commenced in September, 1853. This work has been completed.

CROSS-CUTTING OF STONES.

Gentlemen,—I have made various experiments in cutting stones across the grain; sandstone for filtering purposes, and firestone for bringing into contact with vessels to evaporate liquids. Having made sugar in the West Indies for seven years, I have come to the conclusion that a great change must be effected by slicing the cane (instead of squeezing, as at present), and drying the slices on these porous stones with fire underneath. All the sugar would then be washed out of the slices, and the sweet water evaporate in earthen vessels instead of metal vessels as used at present. It would take a very elaborate article on this very important subject, and, if you desire it, I will give you more information. We are all living in an age of experiments, and the sooner we can perfect any plan the better.

The present mode of making sugar-cane sugar is most ruinous. There is often 15 per cent. loss on the voyage home from the West Indies, and at times 20. But the application of cutting stones across the grain, if in sandstone, enables one to filter oils, rendering them free from all decomposing matter.

Begging pardon for the length of this,

I am, Gentlemen, yours, &c.,

Colin McKenzie Dick.

9, Lower John-street, Golden-square,
Sept. 4th, 1858.

P.S.—The filtration of grape juice to prevent fermentation is not the least of the applications of transected stone.—C. M. D.

[We shall receive the longer letter alluded to by our correspondent with pleasure.—Eds. M. M.]

Monument to George Stephenson at Newcastle.—At the conclusion of the Newcastle dinner in connexion with the meeting of the mechanical engineers, the subject of a monument to George Stephenson, in Newcastle, which had been referred to by Mr. Fairbairn and Mr. Bell, was discussed by some of the gentlemen present. It was determined that a subscription list should be opened at once, and that the local committee of the institution should be requested to take charge of it. The proposal was heartily received and responded to, £500 were subscribed, and several of the non-resident engineers present undertook to act in their several districts in furtherance of the movement.

TRIALS OF SHIPS' PUMPS.

Mr. Stone, of Deptford, the maker of Downton's pumps, is not satisfied with our article upon the above subject, published in this Magazine for Aug. 14, but instead of writing to us has written to the *Times*, and paid for the insertion of his letter as an advertisement. By a strange but characteristic act of carelessness, he there, however, visited the supposed sins of the *Mechanics' Magazine* of Aug. 14 upon the *Builder* of Aug. 23,—for which the Editor of our much-respected contemporary feels, doubtless, little obliged. His letter to the *Times* (of Aug. 28), corrected in this respect, is as follows :—

Sir,—I beg to make the following remarks relative to some statements which appeared in the *Mechanics' Magazine* of the 14th inst., respecting the above trials.

I have not applied for any further tests of the pumps at Woolwich, as stated in the *Mechanics' Magazine*, neither was the Downton's pump used for the trial fitted with larger suction pipes than are always used with them throughout Her Majesty's Navy; even if I had fitted larger pipes, it would not have made the pump any larger, as the *Mechanics' Magazine* supposes. It is untrue that Roberts's pump was worked so badly that eight men at one time did no more than six at another—in fact, Mr. Roberts is fully aware of his having been fairly beaten, and having no other excuse tries the paltry one of blaming the men who worked the pumps, notwithstanding the men who worked Downton's pump having been shifted to his, in order to satisfy him. In trials of pumps, the size or capacity of them should be the first, not one of the last considerations, as suggested by the *Mechanics' Magazine*, for what would be the use of trying a pump which should throw 500 cubic inches of water per stroke against one which should throw 1,000, without first taking into account their respective sizes? The *Mechanics' Magazine* is for once correct in stating that the only way to measure the relative efficiency of pumps is to compare the power applied with the water thrown, which was done at Woolwich in the last trial; and as I have before stated, and was correctly reported in the *Times*, that Stone's Downton's pump worked by the same number of men as Roberts's threw 25 per cent. more water in the same time, although Roberts's pump was 60 per cent. larger, giving a result of 85 per cent. in favour of Downton's, with eight men on Roberts's and six on Downton's, the result was more than 70 per cent. in favour of the latter.

In my letter to the *Times* of the 19th inst., I have shown that Downton's pump possesses an advantage over Roberts's in every respect—viz., taking the sizes into consideration, it threw 85 per cent. more water than Roberts's in the last trial at Woolwich. It can be made to put into a boat, and used as a floating engine in two-thirds the time Roberts's requires. In proof of its portability, a few days since a 7″ Downton's pump, mounted on wheels, and used as a yard fire-engine by the eminent shipbuilders of Blackwall, Messrs. R. and H. Green, was the means of more than six houses being saved from destruction by fire. This was the private engine mentioned in the account of the fire which appeared in the *Times*.

It can be taken to pieces in much less time than Roberts's. It can be worked by about one-half the number of men Roberts's requires. It occupies less room on the deck of a ship than Roberts's. Its suction valve can be cleared in one-fourth the time Roberts's requires. It can be used as a syphon with more effect than Roberts's, as a stream of water the full size of the suction pipe can be let into a ship's hold without any pumping at all, which is not the case with Roberts's. Both the *Mechanics' Magazine* and Mr. Roberts seem to think that using a pump as a syphon is quite a novelty, but this is a great error, Downton's pumps having beeu used as syphons in Her Majesty's navy and elsewhere a great number of years. Lastly, as I before stated, I have never heard of any complaints against Downton's pumps, although they have been used in Her Majesty's navy upwards of thirty-five years, whereas Mr. Roberts's pumps, through reasons I explained in my letter to the *Times* of the 19th inst., have turned out a perfect failure on board the *Monstuart Elphinstone* during her last voyage, which vessel was fitted with Roberts's pumps. This statement I am prepared to prove.

Josiah Stone.

Deptford, Aug. 28.

We shall take but little trouble ourselves in replying to this letter. Those statements of ours which Mr. Stone questions were made on what we believe to be much better authority than his, and he apparently seeks to involve us in quibbles—such as whether his manager's acts are his—into which we refuse to be drawn. The wrong-headed manner in which he first admits we were correct in stating that "the only way to measure the relative efficiency of pumps is to compare the power applied with the water thrown," and then drags in "60 per cent. larger," and "70 per cent. in favour," &c., can need no remark from us.

We have, however, received a letter from Mr. Roberts upon the subject, which is too long for its insertion entire in our columns,

but which we have cut down to the following, without otherwise altering it. The unabridged letter appeared in the *Times* of Wednesday last. But what follows will, we apprehend, do all that is needful towards enabling our readers to estimate Mr. Stone's statements as they deserve. It appears in small type, not from any want of interest—for this pump controversy is really of immense importance, especially to the shipping interest—but solely to meet the pressure upon our space.

To the Editors of the Mechanics' Magazine.

GENTLEMEN,—Mr. Stone having attacked me in the *Times*, I feel compelled once more to trouble you with a few remarks, but have deferred doing so until I made inquiries respecting some of the statements contained in his letters. With regard to my former letter, I have only to say, that the officers who conducted the trials, having read it, upon being asked by me if there was anything incorrect in it, answered "Nothing whatever." I can, therefore, with confidence refer any gentleman to them for its confirmation. When I made my 6¼" pump, I fitted it with a 3¼" inch delivery, because it was the size used to a 9" Downton's pump. Mr. Stone says Downton's 9" pumps are always fitted with 4" suctions, but he carefully omits all mention of delivery. Will Mr. Stone inform us how long it has been so, and where there is another 9" Downton's pump throughout Her Majesty's Navy with a 4" delivery besides the one used at the trial, which he had altered *without leave?* No person knowing anything of pumps would assert, that enlarging the suction-pipes and delivery would make a pump any larger; but they will agree that enlarging them 33 per cent. will make them work much more easily, and would be a most decided advantage in the mere delivery of water, particularly when worked with the minimum number of men, and six men was the smallest number that could work the pumps; in fact, it was not enough, for the men were so exhausted at the end of two spells of 15 minutes each, that the third trial was shortened to 10 minutes. But the question may be asked, Why work with so few men? My answer is, because Mr. Stone, having possession of the field, chose that number. I objected, because the maximum is the most efficient number to work with. "Oh, yes," said he, "no doubt if the pumps are worked with twelve men, you will beat, because you have the larger capacity."

Now, this speaking of the number of men brings me to another point of Mr. Stone's letter. He says it is untrue that eight men at one time did less work than six at another. Now, this is a point I would gladly have passed over, but, in justice to the Editors of the *Mechanics' Magazine* (not the *Builder*) I cannot. The facts of the case are as follows:—On the 6th ult., at the end of the second trial of fifteen minutes with six men to each pump, it was found that the water had gained $\frac{1}{8}$" of an inch against me: the water was again made level with the mark, and at the end of ten minutes with eight men to my pump and six to Downton's it was found to have gained $\frac{3}{16}$" of an inch against me. Now, as 3-16ths is 50 per cent. more than 1-8th, and as ten minutes is 33 per cent. less than fifteen, according to Mr. Stone's way of reckoning,—that is, adding the two together,—it will make 83 per cent. But I believe the actual gain of the six men at Downton's over the eight at mine was ·5, or about 0½ per cent.

Now we are upon the subject of percentage, I must trouble you with a few figures. In the report of the trials in the *Times* of the 7th ult., it is stated that my pump is calculated to throw 927 cubic inches, and Downton's pump, being nine inches diameter, and nine-inch stroke, equal to 572 cubic inches; and it is upon the assumption that this is correct, that we hear so much about 60 per cent. Now, as I do not like to think that Mr. Stone would wilfully make a statement that he knows to be false, I am compelled to think that he knows very little of the subject upon which he has been writing, and has been most grossly imposed upon by others. And now for the proof:—Since the trials, I have had an opportunity of measuring the stroke of Downton's buckets, and find it to be two of $4\frac{5}{8}$" and one of 4¾", or 14" together, not 9" as stated. This would give a volume of 890·54 cubic inches. But there are such things as piston rods, which do not appear to have been dreamed of in Mr. Stone's philosophy, although they enter rather largely into the composition of the Downton's pump, as we have to deduct for them the bridges and valves, as near as I could get it, 102 cubic inches from the above 890·54, leaving only 788·54 cubic inches effective capacity; or, in other words, they absorb about 11½ per cent. of the whole space. In my pump they occupy 10·99", or not quite 11", or $1\frac{1}{8}$ per cent. This makes my pump just 14 per cent. larger capacity than Downton's, instead of 60. Again, the number of revolutions to fill the three tanks on the 21st of June was found to be with my pump 240, and Downton's 306, or about 25 per cent. difference. And I think the discrepancy between 14 per cent. theoretical and 25 actual capacity will be readily understood when I tell you that my pump has only four valves and two small stuffing-boxes, and Downton's has seven valves and five stuffing-boxes. Had Mr. Stone been present at these trials, he would have seen that the water was pumped into and out of the tanks, so that time, quantity, and number of revolutions could be noticed; but if his nerves are so very delicate that the excitement was too much for him, considering that he had notice of the trial, and was represented by two or three of his foremen, his conduct in now pretending to doubt the accuracy of the result is so "paltry," that I did not expect it even from Mr. Stone.

I will now proceed to ascertain how near the actual work done approached the theoretical. The tanks used were 4ft. × 4ft × 3ft., or 72,944 cubic inches; this divided by 918, the capacity of my pump, gives a quotient of 76; but, as the actual number of revolutions was 80, it was about 5 per cent. loss. 72,944 divided by 788·54 (Downton's capacity) gives a quotient of 92·5; but, as the actual number of revolutions was 102·66, it gives a loss of 10 per cent.,—just double mine. Again, if Downton's pump had been only the size Mr. Stone represented it,—viz., 572 inches, it would have taken 127 revolutions to fill the tanks, supposing there had been no loss; but as the loss as mentioned above was 10 per cent., this would bring it to 139 revolutions, or from 25 to 28 per cent. more than it really took to fill it. Does Mr. Stone mean to tell us that one-fourth more water came out of his pump than it could contain?

Again, Mr. Stone, quoting from the *Mechanics' Magazine* (not *Builder*) says, "The only way to measure the relative efficiency of pumps is to compare the power applied with the water thrown, which was done at the last trial," but unfortunately for Mr. Stone's veracity, the last trial was the only one upon which the water thrown *was not measured;* it was simply one pump pumping into the boat and the other pumping out, and at the end of a given time seeing which had gained; and it was not until Mr. Peake had a section of the vessel taken, and calculated the quantities, that he could give any result at all; and, upon my asking him yesterday what it was, he said one and one-tenth per cent. against me, instead of the 85 per cent. that Mr. Stone is so fond of talking about.

Again, Mr. Stone says that a pump of 60 per cent. larger capacity should do 60 per cent. more work than the smaller with the same power. As this only shows how ignorant he is of the first principles of mechanics, I shall take no further notice of it.

Mr. Stone says Mr. Roberts never ventured to take his pump to pieces, but merely took off his air-chamber and looked at his suction valves. I beg to inform you that I ventured to place my pump entirely at the disposal of the authorities, to test it in any way they might think fit, without any restrictions whatever. He is also incorrect in stating that I only looked at my valves, as they were taken quite out, and held up so that they could be seen by Mr. Peake, who, as soon as he looked at them, said, "Now put them in again." This was done, and the water fetched in $1\frac{1}{2}$ minutes with the $5\frac{1}{4}''$ pump, and 1 minute 50 seconds with the $6\frac{1}{4}''$; and be it remembered, in this time the upper valves were unbolted, taken out, replaced, and refixed; but Downton's pump was only taken sufficiently to pieces to *look* at the valves, yet occupied 20 and 10 minutes respectively, and then were not in working condition, in consequence of some parts not being put together properly. So much for the assertion that Downton's can be taken to pieces in less time than mine. It is quite true that the valve Mr. Stone alludes to in the goose neck of the suction plate—which, by the way, is quite a separate piece of machinery, although the pump is not complete without it—can be got at as quickly as my valves can; but then there are six other valves boxed up in the pump which cannot be got at without taking the pump all to pieces, and it is quite a fallacy to say they cannot choke, because every valve is liable to choke or foul, no matter what its construction; and there were officers present at the trial on the 21st of June who stated that they had seen them choke, and that too at a very critical time, viz., when the vessel got on shore: whereas one of the advantages I claim is being able to get at all my valves readily, and without taking my pump to pieces. More than that, I can take off my air chamber, and look at my valves *without stopping the pump at all*; but Mr. Stone cannot even look at his suction valves, as he calls them, with stopping and losing his water.

And now for a few words upon portability. Mr. Stone says Downton's can be used as a floating engine in two-thirds the time that mine can. On the 15th of October last, at our first trial, when I proposed to use my pump as a syphon and floating engine, Mr. Stone asked who ever heard of such a thing; and, when asked by Mr. Peake if he could move his pump,—and the one then tried was one made by Mr. Stone expressly for the trial,—after consulting with his officers, he said it could not be put into a boat, and he did not think any more could be done with it than had been done. Mr. Peake then said, "Now, Roberts, it is in your own hands; let us see what you are going to do;" and the result was that my pump was in full play in the boat, throwing the water 83 ft. high within ¼ of an hour. There has not been any alteration made in Downton's pump since that, and yet Mr. Stone now says it can be shifted into a boat, and made a floating engine in two-thirds the time mine can, or ten minutes. Since the publication of Mr. Stone's letter I have made inquiries, of every person that I thought likely to know, if ever Downton's main pumps, when fitted with suction-plates, as they are invariably when more than one suction is wanted, had been, or could be, readily converted into a floating engine, and the answer has been invariably "No."

Again, Mr. Stone says, in proof of its portability, a 7″ Downton's pump, mounted on wheels, and used as a fire-engine by the eminent ship builders, Messrs. R. and H. Green, was the means of more than six houses being saved, &c. Now, this shows to what straits he is driven to patch up his case. There is no doubt that Downton's pump is a good pump, and the one in question was made by Downton, *and fitted up expressly as a fire-engine* for Messrs. R. and H. Green fourteen or fifteen years ago; at least, I can recollect it that time, and it has never been used for anything else. Now, as Mr. Stone has given me an opportunity of proving that Messrs. Green are well acquainted with Downton's pump, I beg to submit a copy of testimonial I had the honour to receive from Richard Green, Esq., the head of the above-named eminent firm.* I should state the ship named therein was the beautiful frigate-yacht built by the Messrs. Green for the King of Portugal, and was fitted with one of my $5\frac{1}{4}''$ pumps and an 8″ Downton's pump, made by Stone. I may also add, that I have one equally flattering from the Portuguese Captain. In concluding this part of the subject, I beg to state that, my pump and suction-plate being in one casting, it forms a flat base, so that the pump, of whatever size, stands firmly wherever placed; it only wants the four holes for the suction pipes, and these can be bored out with dowel bit within half-an-hour; or, in case of one ship in a squadron getting on shore, or springing a leak, as every ship has two or more pumps, one of them could be taken on board the damaged ship, and a couple of planks placed across the hatchway, and four screws would be quite enough to fix them. This could be done within half-an-hour, and it is scarcely necessary for me to say a word of the advantages of a pump that can do this. But Downton's pump and suction-plate, being different things, one standing here and the other there, and one of no use without the other, cannot be shifted under many hours, if at all. In this opinion I am supported by every gentleman that I have spoken to on the subject, both in and out of Her Majesty's service, and I have spoken to a great many of late.

And now for a few words about the syphon. Mr. Stone says Downton's can be used as a syphon with more effect than Roberts's, as a stream of water the full size of the suction pipe can be let into the hold without any pumping at all, which is not the case with Roberts's. Now, this is sheer nonsense. A syphon will not work at all unless it runs a full stream, for the moment air gets in the water keeps out; and, if it is necessary to pump after the air is exhausted, it is not a syphon at all. Now, as I have proved on board Her Majesty's ship *Industry* that my suction pipes can be converted into a syphon within six seconds, by simply giving a half-dozen turns of the pump handles to exhaust the air, when the ship was light it ran in so that the water raised in the hold at the rate of $1\frac{1}{4}''$ per minute, and when deep at the rate of $2\frac{1}{4}''$ per minute (and this not the first $2\frac{1}{4}$ of the ship's hold, there being 12″ in at the time of commencing), without the water passing into the pump at all. It was again shifted to a pump, and the water coming out of the hold within three seconds. Now, as I cannot see any means of connecting any two of Downton's suction pipes and exhausting the air without a piece of hose being connected, and the whole of the water passing through the pump, and having asked the opinion of several gentlemen, some of them holding responsible situations in Her Majesty's service, and all well up in the matter, and as they all say they have never heard of it being done, and cannot see how it is to be done, I say that, unless Mr. Stone can prove that it can be done, and quicker than I have done it, as stated above, and without a single stroke of a pump, he has proved he is quite ignorant of the subject upon which he has presumed to write.

Once more: Mr. Stone says that, from the intricacy of my passages, they are only fit to pump up clean water, &c., &c. The first pump I made was fitted on board the *Undine*, a large yacht belonging to the Most Noble the Marquis of Stafford. Upon the return of the yacht from Russia, I had the honour to receive a note from his lordship informing me that my pump "answered most perfectly," and that "having a pump of that sort on board a vessel is a great additional security." I am happy to say it still maintains its character. The next was the unfortunate one on board the *Mount Stewart Elphinstone*. [Mr. Roberts here gives a very clear and straightforward narrative, showing that the defects on board the vessel mentioned

* This testimonial strongly asserts the superiority of the Roberts' pump.—Eds. *M. M.*

arose from exceptional causes, which in no way depended upon the pump itself.]

Some time before I fitted the above ship, I had an order for a pump from Messrs. Young, Son, and Magnay, of Limehouse, to pump out their graven docks; and I think, Sir, if there is any place to try a pump it is a graven dock, for there we have chips, shavings, oakum, tar, mud, and other things too numerous to mention. And I lent them a 6″ pump, made from the same patterns as the one fitted on board the *Mount Stewart Elphinstone*.

A 9″ pump, also made for Messrs. Young, Son, and Magnay, is now upon the *Great Eastern* doing duty until her pumps, which I am making, are ready for her. The day after Mr. Stone's letter appeared I met Mr. Sidney Young, and asked him how the 9″ pump was going on; he replied, "Very well, as far as I know." I said, "Do you find that it will only bring up clear water?" He said, "I believe it brings up anything that comes in its way," but he would inquire. I saw him again this morning, and he told me it was no consequence whether clear or foul, it came up, and I could refer any one to him for confirmation.

I do not think it necessary for me to trouble you with any more certificates, although I have them, all speaking equally well of the general efficiency and superiority of my pump.

Since I commenced this letter I have been over to the Tile and Pottery Works, Stoke Newington, where I have a pump an exact counterpart of the last one tried at Woolwich, but with an enlarged delivery, our object being to drain the pits as quickly as possible, and with seven men. When they made a spirt, they got 58 revolutions per minute, and when they did not know that we were watching them, they worked at 50 with eight men, being from 8 to 16 revolutions more than were obtained at Woolwich,—so much for large delivery. For the correctness of this, I beg to refer to Jas. Reeve, Esq., of Leyton, Essex, a gentleman well known in the City, who was present; or to H. B. Langmore, Esq., the proprietor, either at the works or at 13, Great St. Helen's; or, as the pump will be at work for some days yet, any person can go and see it, and judge for themselves.

But it is rather curious that Mr. Stone did not find out that my pump was so useless until I took the making of the castings away from him. At first he was very anxious to make arrangements for making them entirely; at least, I had overtures to that effect through his manager. And why did I take them away? Because I understood that he had castings made from my patterns in his possession, and I have since had proof that it was so, for I saw in the hands of Mr. Preston, his manager, on the day of the last trial at Woolwich, castings for a model of my pump made from my patterns, without my knowledge or consent. I make no comment upon this, but leave your readers to form their own opinions.

I have written thus fully because I do not intend to continue the controversy any longer; but, if any of your readers are not satisfied with my statements, I ask them to suspend their judgment until the official report is published, or else make inquiries for themselves in the proper quarter. In conclusion, I beg to return my sincere thanks to all the officers of Her Majesty's Dockyard, Woolwich, with whom I have come in contact during these trials; from the highest to the lowest their conduct has been most impartial and gentlemanly.

I remain, Gentlemen, your obedient servant,

WM. ROBERTS,

Foreman to Messrs. Brown, Lenox, and Co.

Millwall Cable Works, Sept. 1st, 1858.

THE SAILS OF VESSELS.

Gentlemen,—When I was a boy kites and boats were my favourite toys. I have tried kites with plenty of belly, and also flat kites. The object of the kite being to ascend I found flat kites the best, and as to pulling there is a very slight difference between the two. The elastic kite refuses to ascend so high as the flat one, and therefore assumes a more vertical position, thereby receiving a more direct impulse from the wind, and *this* (not the belly) causes the greater part of the extra pull. The vacuum behind the kite is but very slightly altered by the form.

Mr. Meyer must, surely, be aware that vessels do not always run before the wind, and that the chances are at least thirty-two to one that a vessel will not have the wind right aft. From my experiments with models, and also with sailing boats on the coast, I have found flat sails the best even when running before the wind; and it is reasonable that it should be so, as the more extended the sail the more wind is arrested. But when sailing on a wind or close hauled, Mr. Meyer's *cup-surface* sail would be perfectly absurd.

With respect to Mr. Meyer's remarks on steamship propelling, I must say his assertion is truly monstrous, and if he will refer to the last number of the *Engineer* he will see it stated that well-formed vessels at ten miles an hour require only the same power as the same load would require on a level railway.

I am, Gentlemen, yours, &c.,

T. Moy.

1, Clifford's-inn, 7th Sept., 1858.

[We are obliged to Mr. Moy for his satisfactory reply to Mr. Meyer's letter. We stretched a point in giving it place, believing that one of the many gentlemen who read our pages intelligently would dispose of it, and, perhaps, do indirect service at the same time. We have felt compelled, however, to decline certain other letters of Mr. Meyer, of which our readers would have formed opinions still lower than that expressed by Mr. Moy.—Eds. M. M.]

THE HOROLOGICAL JOURNAL.

A new journal, under the above title, has just appeared, as the organ of the British Horological Institute, which was established in February last. There is not, we must say, much promise in the first number now before us; nor, indeed, was there room for much, as it is chiefly filled with statements respecting the institute. Time will doubtless ripen it. Our young contemporary will, we hope, accept a word of counsel from us, who have been many

years gaining experience. We would caution it against two things—crudity and want of refinement. In this first number a correspondent writes:—"I have grown grey in the trade, and can remember the earliest numbers of the first periodical professing to be in the interest of mechanics and mechanical science, namely, the *Mechanics' Magazine.* I was but a lad, but I still remember with what delight I saw questions and answers upon the most rudimentary mechanical and arithmetical problems, and am not ashamed to admit that, simple as they were, they appeared to me at the time, not only very profound, but they certainly did start many a train of thought, and caused amongst labouring men many a chat, which ended in the best results. Now, I cannot but think that the adoption of such a course will secure you a great many readers, who would otherwise fail to find sufficient to interest them." —And in the first number we also find a letter signed "Somnus," in which the expressions, "A jolly long one," "I'm bless'd if I can tell," &c., occur. Now, observations of this kind are out of place in such a journal as this ought to be. They are not witty—they are not even harmlessly familiar; they are examples of studied inferiority of style, which the meanest workmen would do well to avoid in writing to a respectable journal. As to the early numbers of our magazine, we can quite understand the delight with which they were received by many, and believe they were well calculated to inaugurate, as they most certainly did, a cheap class of scientific literature. But we should be very much ashamed to produce the same kind of literature now, after our thirty-five years of active existence. Times change, and we change, and must change, with them. A journal which succeeded beyond all expectation thirty-five years ago would fail utterly now if unaltered in style and substance; for working men now know more than the professors of that day. We make these remarks because we wish our contemporary success.

GEOLOGICAL DRAINAGE.

Gentlemen,—About twenty-five years ago it occurred to me, that artesian wells might be used for draining. I *intended* to write to *Bell's Weekly Messenger* on the subject, thinking the plan would be highly useful to the readers of that "farmer's paper." I delayed doing so too late, and one fine morning I read in that same paper, that artesian drainage had been tried abroad, and found to answer very well indeed. Any one curious enough to search the file of *Bell's* will find the paragraph of the date of the latter part of 1833 or beginning of 1834, so that we have nothing new in geological drainage but the name.

I am, Gentlemen, yours, &c.,
J. Simon Holland.

Woolwich, September 4, 1858.

THE DUTCH STEAMER "TELEGRAAF."

Gentlemen,—Can your readers give any information respecting the dimensions of this vessel? The *Illustrated London News* states that it has attained a speed of twenty-one nautical miles an hour. This does not take me by surprise, though I have no doubt it will surprise parties interested in the Holyhead and Kingston service.

I have no doubt the dimensions of the above vessel, and whether she is built on the wave-line system, would be interesting to your numerous readers as well as to myself.

I am, Gentlemen, yours, &c.,
T. Moy.

RIFLE BATTERING RAM.

Gentlemen,—The manager of the Rosherville Gardens having kindly granted me leave to fire my rifle four-pounder cannon at a high chalk cliff within the gardens, I constantly fire my rifle battering ram with a charge of not more than two ounces of powder with a range of fifty yards, that being sufficient to prove the efficiency of gun and ram. Specimens of the ram are to be seen at the South Kensington Museum and the United Service Instititution.

I am, Gentlemen, yours, &c.,
J. Norton.

Rosherville, Sept. 7th.

A New Photographic Journal.—This day is published the first Number of a new Journal, entitled "The Photographic News," which is to form a weekly record of the progress of photography and its allied sciences and arts; edited by William Crookes, F.C.S., to whom amateurs are invited at once to forward a statement of any difficulties they may meet with in the practice of photography. Mr. Crookes is a gentleman thoroughly able to conduct such a journal efficiently. We only hope the undertaking will not be allowed to divert him from his practical photographical operations which he has hitherto conducted with so much success. One excellent feature of the new publication is, that it will furnish a dictionary of the photographic art, forming a complete encyclopædia of all the terms, formulæ, processes, and materials in use, together with a comprehensive list of articles of every description employed in its practice. The new journal will be of the same price as our own.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

MANNING, J. A. *Improvements in the manufacture or production of manure.* Dated Feb. 1, 1858. (No. 179.)

This invention is described at page 231 of our last Number.

BARTHOLOMEW, G. *Improvements in horse shoes, and in attaching the same to horses' feet.* Dated Feb. 1, 1858. (No. 180.)

The shoe proper, or the wearing part, resembles the common shoe, and is formed with the usual nail holes, but it is attached to the foot by a species of inclined spring clipping piece formed of two thin pieces of metal. This clipping piece is attached to the upper or hoof side of the shoe by nails passed through the holes in the shoe body, and driven up through the space left between the two layers of the clipping piece. The latter is inclined so as to suit the slope of the hoof, the lower part of which it is to embrace. It is made wider on the heel side than the actual width across the heel, to enable the shoer to spring it into its fixing position. To accomplish this, one side only of the clipping piece is permanently attached to the shoe.

CHILDS, J. *An improvement in the manufacture of the boxes or cases used for night-lights.* Dated Feb. 1, 1858. (No. 181.)

The cylindrical portion of each box or case is made of paper or wood, and to form the bottom the cylinder is placed on a mandril so as to leave a small length of the case beyond the mandril, into which cement is run, and allowed to set before running in the fatty matter to form the night-light. On the top of the mandril there is a spike to produce a recess for the end of the wick in the plaster bottom.

NEWTON, W. E. *An improved clasp or fastening for joining the ends of belts or bands.* (A communication.) Dated Feb. 1, 1858. (No. 182.)

This consists of a bar or rod provided with arms or fingers extending at right angles from it, and taking into slots or spaces in another bar or in a plate.

HASTE, J. *Improved apparatus for preventing the explosion of steam boilers.* Dated Feb. 1, 1858. (No. 183.)

This relates to a mode of constructing the safety valves of steam boilers, and the introduction of an internal or additional self-acting balance valve or valves, which will operate when the pressure of steam in the boiler slightly exceeds that at which it is intended to work. One of the essential features and advantages of the invention is that the valves are so constructed that they are placed beyond the reach of the attendant, who is thereby prevented from tampering with them. The invention cannot be fully described without engravings.

BROOMAN, R. A. *Improvements in burners for generating and burning gas from hydro-carbon fluids.* (A communication.) Dated Feb. 1, 1858. (No. 184.)

This relates to self-generating gas burners, for employing liquid hydro-carbons, such as camphine, naphtha, &c., to produce light without wicks or chimneys, or requiring the fluids to be diluted with alcohol. It consists, 1. In attaching to the burner heat conductors, capable of being adjusted so as to vary and regulate the amount of heat to be produced in the burner, for maintaining the due vaporisation of the hydro-carbon fluid without interfering with the flame. 2. In a method of regulating the admission of atmospheric air to the mixing tube, so that the proper dilution of the hydro-carbon vapour is readily accomplished near the place of its combustion. 3. In a construction and working of the valve for regulating the flow of the gas-making material to the burner. Engravings are essential to a complete description of the invention.

BROOMAN, R. A. *Improvements in sewing machines.* (A communication.) Dated Feb. 1, 1858. (No. 185.)

These are designed for employing a barbed needle instead of one having an eye near its point, as usual; and consist, 1. Of a means of actuating the needle, whereby its movement through the material to be sewed shall also produce the feeding of the same along; and, 2. In a method of regulating the vibration of the said needle, whereby the feed for giving the various lengths of stitches is obtained. These cannot be described without engravings.

HAY, W. J. *An improved composition suitable for covering the caulking of ships and other like purposes, for uniting wood and other substances, for filling up seams, and for use as a water-proof composition generally.* Dated Feb. 1, 1858. (No. 186.)

This composition is to be run in over the caulking in the decks of ships, and to be payed over the caulking in the sides of ships and vessels, to be run in and fill up the seams in wooden and other structures, also to be used as a glue to unite pieces of wood, as a waterproof composition for roofs, floors, iron ships, and other iron work, &c. The composition is formed of the following ingredients:—Asphalte or Trinidad pitch, vegetable tar, and oil naphtha, with or without the addition of caoutchouc. Or instead of naphtha the patentee uses rough creosote, spirit of turpentine, or any other spirit or essential oil; or he combines two or more of these ingredients and mixes them with asphalte or Trinidad pitch and vegetable tar.

HOLMES, W. C., and W. HOLLINSHEAD. *Improvements in the manufacture of gas, and in apparatus employed therein.* Dated Feb. 2, 1858. (No. 187.)

These consist in conducting the vapours produced, as described in the specification of Patent No. 1,405, for 1855, to another vessel, where they are subjected to the further action of super-heated steam, so that the temperature may be raised, the formation of tar prevented, and a greater amount of illuminating gas obtained.

NEWTON, W. E. *Improvements in obtaining certain compounds of nitrogen to be applied in the composition of artificial manures, and for other useful purposes.* (A communication.) Dated Feb. 2, 1858. (No. 188.)

This relates to the absorption of compounds of nitrogen with oxygen, produced in the manufacture of sulphuric acid, by means of alkaline earths, and the application of the compounds so obtained in the composition of artificial manures.

SHOLL, J. *Improvements in the manufacture or preparation of paper for writing and copying purposes.* Dated Feb. 2, 1858. (No. 190.)

The patentee takes ordinary writing paper, and immerses it in whiting or purified chalk (carbonate of lime), mixed in water to a creamy consistency. After two or three minutes, he washes all the superfluous chalk matter from it in clean water, and afterwards dries and finishes the paper in the manner of finishing writing papers. Or, instead of applying the chalk or whiting to the paper after being made, he introduces it with the paper pulp after it has been prepared for spreading into sheets, and then completes the manufacture of the paper in the ordinary way. Instead of mixing the chalk with the pulp, he prefers to mix it first with the size or gluten used in the manufacture of paper, and applies it to the paper material with such matter.

GRAY, J. *Improvements in printing machinery.* Dated Feb. 2, 1858. (No. 192.)

This consists of the total separation of the type table (the table on which the types are placed during the process of printing) from the machine, for the purpose of making up the forms of types thereon, instead of making them up, as at present, in "chases" or on "turtles" (technically so called), to be afterwards conveyed to the type table.

HOLLIS, A., and S. LEE. *Improvements in the construction of chaldron waggon and other railway wheels.* Dated Feb. 3, 1858. (No. 195.)

The patentees construct their wheels in four parts, of which two spokes, two portions of the rim or felloe, and one quarter side or segment of

the nave form one part or fourth. The spokes being made solid on the piece forming one side or segment of the nave are then bent to form a portion of the rim or felloe, each extreme end of such portion having a tenon to fit into the shoulder of the portion of the rim or felloe next it through a mortice. These four parts of the wheel are fitted together, and the four nave sides or segments are secured by strong hoops contracted thereon. These parts form the entire skeleton wheel on which the tyre is shrunk in the usual manner. The axle end (square or round) is wedged or keyed on to the nave according to common practice.

DILLAGE, E. F. *Improvements in machinery or apparatus for raising, forcing, and exhausting fluids, air, and gases.* (A communication.) Dated Feb. 3, 1858. (No. 197.)

This apparatus consists essentially of a hollow square chamber, formed on each side with recesses, in each of which works a flexible diaphragm attached to a hinged plate, and receiving an oscillating motion from suitable mechanism. Each recess is connected by two pipes fitted with clack valves with a lower and an upper reservoir. From the lower a suction pipe leads to the place to be drained or exhausted, whilst the discharge pipe is connected to the upper reservoir.

HARRISON, J. *Improvements in apparatus for making cheese.* Dated Feb. 4, 1858. (No. 203.)

The patentee places above the cheese vessel a toothed rack capable of sliding between two vertical bars. At the lower end of this rack is a plate pierced with holes, and fitting the inside of the vessel. The holes are covered with finely perforated metal. This plate is wound up out of the vessel, and pushed out of the way when the curd is to be cut. The rack with the metal plate is moved in and out of the cheese vessel by a toothed pinion keyed upon a shaft. Upon the end of this shaft is also keyed a grooved wheel, around which a chain passes to a wheel below. To this chain a weight is attached which gives motion to the pinion, and thus lowers the rack and perforated plate, to separate the curd from the whey in the cheese vessel. There are also strong springs, with a casting. By raising the casting the springs are compressed, and sufficient pressure is obtained to free the curd from any whey which may be left after the sinking process. The whey is let off by valves provided with pistons.

HARLAND, R. *Improvements in the brake-lever guard of railway trucks.* Dated Feb. 4, 1858. (No. 204.)

This relates to the guard of the brake-lever of railway trucks. At the end of the brake-lever is to be jointed a quadrant which moves through a bearing fastened to the side of the truck, extending upwards above the brake-lever. The lever when out of work is held by a catch fastened to the side of the truck, and which also presses against the side of the quadrant when the brake is put on, and thus steadies it while at work.

BERTRAM, G., and W. MCNIVEN. *Improvements in the manufacture of paper.* Dated Feb. 4, 1858. (No. 209.)

This relates to the "knotting machine" or pulp strainer, and it bears mainly upon an invention patented by the present patentees Nov. 8, 1856.

RHODES, W., and H. NAPIER. *The production of a new paint oil.* Dated Feb. 4, 1858. (No. 212.)

This consists in mixing with rosin oil two per cent. of soda ash, distilling and then mixing the product with half its weight of rosin.

COLLINGWOOD, E. and T. *Certain improvements in machinery or apparatus for propelling vessels on water.* Dated Feb. 5, 1858. (No. 214.)

This consists in an apparatus designed to effect the entry of the paddles by which the vessel is propelled into the water edgewise, and also to bring them out of the water in that position. The apparatus cannot be described without engravings.

WELCH, J. *Improvements in railway and other carriage breaks.* Dated Feb. 5, 1858. (No. 216.)

Upon the axle of a railway or other carriage is placed a drum loosely, but furnished with a spring catch acting against a stop on the running wheels. To the drum is applied a brake, to be acted upon through the drums by the backward pressure of the ordinary buffing apparatus, or otherwise to be brought into action by the reversed action of the propelling power; the same brake may also be brought into action by the ordinary hand apparatus, if required. The carriage may run either end foremost, the spring catch (which may be adjusted almost by a touch) on each journey being set accordingly.

SHAW, SIR C. *Improvements in constructing movable or field batteries.* Dated Feb. 5, 1858. (No. 217.)

A carriage is mounted on wheels, arranged with compartments for carrying powder and ball, and fitted with horizontal rows of barrels (by preference rifled barrels) so that the whole may be simultaneously discharged.

WILLIAMSON, S. *Improvements in the construction and mode of affixing street and other gas lamps or lanterns.* Dated Feb. 5, 1858. (No. 218.)

The lamp is made portable, and in three parts—viz., the head, the canopy, and the under frame or body, connected by certain detailed parts which need not be here described. A new mode of attaching the lamps to posts or pillars is effected by tinned iron bolts and nuts, the nuts being soldered into each angle of the bottom, and the bolt having a ball cast on the head. The bottom of the lamp is placed on the top plate of the posts, and the bolts passed through the head and screwed into the nuts. Other details are included.

DYER, S. *Improvements in the method of reefing, furling, and securing all the sails of ships or vessels.* Dated Feb. 5, 1858. (No. 219.)

This cannot be described without engravings.

CANDELOT, L. F. *Dicers anti-nitrous cements, also applicable to rendering damp surfaces impervious, and to flagging and similar purposes.* Dated Feb. 6, 1858. (No. 220.)

One of the compositions consists of a solution of boiled oil, colophany, turpentine, wax, stearine, liquid india rubber, and a powder consisting of glass or silex, chalk, grey oxide of zinc, talc (or preferably sulphur), and lime. This composition may be modified, and several others are described.

POTTS, W. *Improvements in painting upon glass, and in protecting paintings upon glass.* Dated Feb. 6, 1858. (No. 222.)

In producing some paintings upon glass the patentee first lays on a ground colour, and then removes the marginal colour from the outline of the design, by which means transparency of effect is produced. He paints some portion of the design on the face of the glass and other portions on the back. The patentee protects the painting by placing a sheet of glass upon the glass painted upon, and with a marginal line of varnished paper between the two plates. He then hermetically seals the edges. The back of the glass painted upon is covered by a sheet of gutta percha, and that is backed up by plaister of Paris, on which the glass carrying the design is securely embedded.

DAVIES, G. *Improvements in the preservation of meat and other animal and also vegetable substances.* (A communication.) Dated Feb. 6, 1858. (No. 223.)

This consists principally in the use of talc for preserving substances by desiccation, and the absorption of the causes of putrefaction. The talc may be used either in a dry powdered state, or made into a paste with salt and vinegar.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

NIELLON, C. *Improvements in the manufacture manure from sewage waters.* Dated Jan. 30, 1858. (No. 171.)

This consists in applying to sewage, brick-dust

and ashes, with plaister of Paris, unslaked lime, fine coal ashes, soot, wood ashes, phosphate of lime, and sulphate of soda, for obtaining a precipitate for use as manure.

BOUCK, J. A. *Improvements in the manufacture of sulphate of copper, and in obtaining certain useful products from such manufacture.* Dated Jan. 30, 1858. (No. 174.)

This consists in roasting native sulphuret of copper, and treating the residue with hydrochloric and sulphuric acid.

HEPPLESTON, T. *Certain improvements in machinery or apparatus for doubling, twisting, and reeling yarns or threads.* Dated Feb. 1, 1858. (No. 177.)

This relates to apparatus for doubling, twisting, and reeling yarns in the same machine. The principle consists in the employment of two or more bobbins upon the spindle, or as many bobbins or threads as are required to be doubled one above the other, and prolonging the flyer with which the spindle is furnished to any length required to extend to the lowest bobbin. Opposite to each bobbin a "curl" is formed in the flyer, so that the thread from each bobbin may pass through a separate one. The threads or yarns are brought from the several bobbins and passed through a guide on the thread rail, from which it passes upwards into a "rail." When motion is imparted to the spindle and flyer, the number of threads from the bobbins will become double and twisted together between the flyer and the guide of the thread rail, and pass upwards in one thread on to the reel or the formation of the hank.

HALL, W. H. *Improvements in the manufacture of artificial leather.* Dated Feb. 1, 1858. (No. 178.)

This consists in impregnating woven or felted fabrics, such as moleskin, with solutions of gelatine, soap, and terra japonica, and then passing them through a solution of alum, or other re-agent, by which the dressing is rendered insoluble in water. The surface may be dressed with the ordinary dubbing, or be enamelled in black or colours.

NEWTON, W. E. *An improved instrument for sharpening the blades of knives.* (A communication.) Dated Feb. 2, 1858. (No. 189.)

This consists principally of a slotted frame, in which are mounted on centres two moveable blades with inclined edges, which are made to overlap each other, something like the blades of a pair of scissors. These blades are kept closed and over each other by springs at their backs, and when a blade or knife requires sharpening it is to be inserted in the slot of the frame between the edges of the moveable sharpening blades, and upon drawing the knife forward the edges of these blades will act on and sharpen the knife.

WESTLEY, W. *Certain improvements in the construction of heels for boots and shoes.* Dated Feb. 2, 1858. (No. 191.)

These consist in forming an entire or partial rim of metal the shape and height of the heel, and the inside of which is filled up with gutta percha, scrap leather, or wood, through which holes may be made for attaching the heel to the boot or shoe. The metallic rim may be japanned, or covered with leather, and (for military purposes) thickened up with steel around the bottom edge; or the rim itself will be made of cast iron, chilled on the under edge, to prevent rapid wearing away.

MOSS, E. *Improvements in weighing cranes.* Dated Feb. 3, 1858. (No. 193.)

This consists in the application of the ordinary system of levers employed in table weighing machines to weighing cranes, whether the same be stationary or travelling.

MORRIS, J. *An improvement or improvements in boots and shoes.* Dated Feb. 3, 1858. (No. 194.)

The inventor applies sheet iron to the under side both of the sole and heel of the boot or shoe by nails or other fastenings.

ARMANI, A. N. *Improvements in rail or tram ways for streets and ordinary roads.* Dated Feb. 3, 1858. (No. 196.)

This consists in casting rails with a longitudinal groove in the upper face, in chilling their upper surface, and in forming them solid at top with sides carried down and terminating at bottom in feet or supports extending outwards therefrom. The sides are cast so as to leave a space between them, which is filled up with concrete, asphalte, &c., and the inventor prefers casting the sides with apertures therein. The ends of each rail may be cast with eyes, which project outwards from the sides, those on the outside to receive bolts for securing the rails together longitudinally, and those on the inside to receive a bolt for connecting a tie-rod or bar for maintaining the gauge between the rails.

NEWTON, W. E. *Improved apparatus for raising and lowering the skirts of ladies' dresses.* (A communication.) Dated Feb. 3, 1858. (No. 198.)

This consists in the use of a girdle with cords united at one end in a knot, whilst their other extremities are attached to the garment. By drawing them up by hand at the knot the dress will be raised to the distance required, uniformly all round. The cords are passed over pulleys.

MAGDELEINE, L. S. DE LA. *An improved manure.* Dated Feb. 3, 1858. (No. 199.)

This consists of a liquid manure in which the grain or seeds are to be steeped before sowing them, or with which the plants may be watered. It is composed of common salt, desiccated nightsoil reduced to a fine powder, water of ammonia, and ashes from wood, peat, or other vegetable matters, all mixed with water.

FOUCHE, V. *Improvements in the manufacture of paper.* Dated Feb. 3, 1858. (No. 200.)

In the ordinary beating machine the patentee inserts a grated or wire gauze passage, through which the water passes, carrying with it dirt, &c., leaving behind the fibre to be reduced to pulp, which is effected by the continuous working of the cylinder. A rotating brush keeps a clear way for the water to flow out. This part of the invention is applicable to the manufacture of paper from vegetable substances in general. It further consists in producing pulp from what is known as "bass" or "bast," without boiling, and also without the use of alkalies or acids.

LONGLEY, W. *Improvements in apparatus for grinding and splitting grain.* Dated Feb. 3, 1858. (No. 201.)

The inventor removes a portion of the face of the runner, and sinks it considerably below the level of the cutting surface, so that it presents a cutting surface of an annular form near the periphery. The furrows of the cutting surface he disposes radially. To deliver the grain at once to the cutting surfaces, he places a disc on the spindle of the stone, immediately below the eye of the runner, on which disc the grain falls when it enters the eye. The centrifugal force throws the grain towards the periphery of the stone, between the cutting surfaces of which it enters, and passes off at the periphery as usual. The grain remains a very short time between the stones, and thus provides for the performance of a large amount of work with one pair of stones. The improvements are principally applicable to splitting beans and peas, or any coarse grinding.

CLARK, W. *Improved hydraulic apparatus for obtaining motive power.* (A communication.) Dated Feb. 3, 1858. (No. 202.)

This invention cannot be described without engravings.

SMITHIES, D. *Improvements in the manufacture of healds or harness for weaving.* Dated Feb. 4, 1858. (No. 205.)

This consists in producing clasp healds by the operation of weaving in a loom of the ordinary construction, instead of by knitting.

BEALE, B. *Improvements in apparatus for paying out and drawing in electric telegraph cables, applicable also to the raising and lowering of weights.* Dated Feb. 4, 1858. (No. 206.)

This consists in the combination of a drum with a cylinder, piston, and connecting rod, and the

usual valves used in steam-engine cylinders. The drum may be used as the paying-out agent, or it may be applied and act by friction upon one, or between two other paying-out drums. When paying out, the apparatus works simply as a brake, but when desired to draw in or draw back the cable, it then acts as a motive-power engine, and works in the reverse direction to that it travelled in when driven by the friction of the cable.

Avery, J. *An improvement in mechanical movements for sewing and other machines.* (A communication.) Dated Feb. 4, 1858. (No. 207.)

To prevent machines working in any but the required direction, the inventor adapts thereto a roller (in conjunction with the fly wheel) moving in a conical recess, and brought into action either to hold or release automatically, by the friction of its surface contact with, and by the motion of the machine.

Knight, C. *An improved railway guide.* Dated Feb. 4, 1858. (No. 210.)

The inventor prints the time tables, &c., for each main line of railway and its branches upon a set of cards or sheets of paper of the same colour, and employs a different colour for each division.

Goodman, J. and L. *An improved portable umbrella.* Dated Feb. 4, 1858. (No. 211.)

This consists, 1. In making the handles of umbrellas in parts, to slide one within the other; and, 2. In making the ribs in two parts divided at the centre, the ends where the division is made being provided with a peculiarly constructed hook and eye, so that, on opening the umbrella and drawing out the telescopic handle, the hook takes into the eye provided for its reception, at the same time resisting the pressure of the outer fabric. The inner ribs or stretchers are reversed. Instead of pushing the runner from the handle up to open the umbrella it is to be drawn downwards. The cover folding with the ribs makes the umbrella one-half the length it otherwise would be.

Crichton, A., and M. Whitehill. *Improvements in the application, adaptation, and use of knitted fabrics.* Dated Feb. 5, 1858. (No. 213.)

It is intended here to apply "tressel net fabrics" for use as ladies' dress goods, as shawls, scarfs, cloaks, &c. The yarns used may either be plain, imprinted, or dyed, but it is preferred to use yarns ornamentally figured or printed upon cylinders with elongated figures or devices.

Woodward, A., and W. C. S. Percy. *Improvements applicable to hoists and other apparatus or machinery for raising and lowering weights, designed as a provision against accidents to which such apparatus or machinery is liable.* Dated Feb. 5, 1858. (No. 215.)

This consists in certain mechanism attached to the cage and balance weight of hoists, viz., a series of levers that when moved in one direction will cause friction blocks to grip against the guides upon which the cage or balance weight slides, and when moved in the other direction will withdraw them. In arranging a brake and lever, so that, should the driving belt get off the driving pulleys, the end of the lever (which carries a pulley) will fall and act on the brake pulley on the shaft that gives motion to the rope or chain employed to lift the cage or other weight. In applying mechanism which, when being rotated by being geared with the brake pulley shaft, will create a movement by centrifugal force, so that when the speed exceeds a fixed velocity the extra centrifugal force will apply the brake.

PROVISIONAL PROTECTIONS.

Dated April 22, 1858.

890. P. E. Aimont, of Paris, civil engineer. Improvements in railway indicating and signalling apparatuses.

Dated July 20, 1858.

1636. R. Clarke, of Cwmbrân, near Newport, mechanic. Improvements in windows, window blinds, and shutters.

1642. W. and J. Asquith, of Leeds, cloth dressers. Ornamenting the surfaces of raised pile fabrics, and in the apparatus employed therein.

Dated July 24, 1858.

1668. W. Merry, of Paddington. Improvements in apparatus for preventing the escape of foul air from area, kitchen, and scullery drains of dwelling-houses, also from street, stable, and slaughterhouse drains.

Dated August 5, 1858.

1776. J. Luis, of Welbeck-st. A new system of truss. A communication.

1780. W. Moseley, of New-st., Covent-garden, and W. S. Champness, of Clapham, gentleman. An improved self-filling reservoir penholder.

1782. J. Henderson, of Lasswade, Mid-Lothian, gentleman. Improvements in machinery for weaving plain or figured fabrics.

1784. C. Mather, of Salford Iron Works, Manchester. Improvements in shearing machines.

1786. W. Clay, of Liverpool, steel manufacturer. An improved mode of manufacturing cast steel and wrought iron into ingots and other forms.

1788. A. V. Newton, of Chancery-lane. Improvements in the manufacture of lace. A communication.

Dated August 6, 1858.

1792. F. H. Stubbs, of Leeds, mechanical draftsman. An improved mode of communication between the guard and engineman on locomotives or railway trains.

1794. S. Carey, of Bankside, Southwark, builder. An improved system of forming the permanent way of railroad transit, also common tramway, and channel or watercourse, by the means of cast-iron plates or boxes, peculiarly constructed so as to make one continuous way or channel.

Dated August 7, 1858.

1796. G. P. Lock, of Liverpool, colour merchant. Improvements in the composition of paints for coating iron ships, and for other useful purposes.

1798. J. Webster, of Birmingham, engineer. A new or improved metallic alloy.

1802. J. Imray, of Bridge-road, Lambeth, engineer. Improvements in apparatus used in printing.

1804. J. Walker, of Glasgow, engineer. Improvements in machinery or apparatus for moulding or shaping metals.

1806. A. V. Newton, of Chancery-lane. Improvements in pianofortes. A communication.

Dated August 9, 1858.

1808. J. J. Murphy, of Belfast, spinner. Improvements in the construction of floating bodies, and in the means of supporting floating structures.

1810. H. Clayton, of Upper Park-place, Dorset-sq. Improvements in machinery for manufacturing bricks and tiles, and other articles of brick earth, clay, or other plastic material.

1812. T. G. Messenger, of Loughboro', Leicester, plumber. Improvements in the manufacture of garden engines, which are also applicable to fire or other engines.

1814. W. E. Newton, of Chancery-lane. An improved method of arranging and applying magnets to counteract or compensate for the effects of local attraction on the mariner's compass. A communication.

1816. W. Spence, of Chancery-lane. The precipitation of purple colouring matter by chloride of calcium. A communication.

Dated August 10, 1858.

1818. A. Barchou, of Saint Augustin's-road,

Camden-town, jeweller. Improvements in the mode of fastening the soles and heels of boots and shoes. A communication.

1822. M. Moses, of Portsdown-road, Maida-hill, gentleman. Improvements applicable to umbrella and parasol sticks.

Dated August 11, 1858.

1826. R. C. Gist, of Cannon-st., gentleman. Improvements in knitting machines. A communication.

1828. J. G. Appold, of Wilson-st., Finsbury, gentleman. Improvements in the manufacture of wire ropes or cables.

1830. E. Tamberlick, of Brussels. Improvements in apparatus used for exhibiting advertisements. A communication.

Dated August 12, 1858.

1832. W. Knowles, of Bolton-le-Moors, cotton spinner. Improvements in certain parts of machinery used in preparing and spinning cotton and other fibrous materials.

1834. G. Houghton, of Birmingham, saddler. An improvement or improvements in saddles.

1838. R. Baxendale, of Manchester, machine engraver. Improvement in brushes, mops, or apparatus for washing and cleaning.

1840. R. Jobson, of Wordsley, Stafford, ironfounder. Improvements in apparatus used when making moulds for casting shells and other articles.

1842. R. Jobson, of Wordsley, Stafford, ironfounder. Improvements in apparatus for supplying water to axletree boxes and other journal bearings to lubricate the same.

1844. R. Jobson, of Wordsley, Stafford, ironfounder. Improvements in apparatus for crushing and sifting.

Dated August 13, 1858.

1846. L. Autra, of Wardour-st., manufacturer. Improved apparatuses for exhibiting advertisements,

1848. C. L. Light, of Pall Mall East, engineer. Improvements in electric telegraph ropes or cables.

1850. J. Petrie, jun., of Rochdale, ironmonger. Improvements in machinery or apparatus for stretching and drying woven fabrics.

1852. G. Schaub, of Birmingham, electro-metallurgist. New or improved machinery to be used in the manufacture of certain kinds of printing types, and also in the manufacture of spaces and quadrats used in setting up printing types.

Dated August 14, 1858.

1860. S. C. Lister and J. Warburton, of Manningham, York. Improvements in dyeing wool, hair, cotton, flax, and similar materials, also yarns and textile fabrics made from such materials, also in dyeing and tanning other substances and materials, also in washing wool, and in discharging the gum from silk.

Dated August 16, 1858.

1865. G. K. Geyelin, of London, civil engineer. Folding bedsteads, and which he calls the universal and folding joint for bedsteads.

1866. P. E. Chappuis, of Fleet-st., manufacturer. Improvements in stereoscopes and stereoscopic apparatus.

1867. C. G. Cutchey, of Forest-hill, gentleman. A railway danger-signal whistle.

1868. L. A. and E. I. E. Hermann, engineers, of Paris. Improvements in connecting together pipes, tubes, or ways, for the conveyance of water or other fluid, and in means or apparatus for regulating the flow or discharge and supply of such fluid, and in means or apparatus for facilitating the forming of such connections.

1869. A. V. Newton, of Chancery-lane. Certain improvements in machinery for forging horseshoes. A communication.

Dated August 17, 1858.

1871. J. Webster, of Birmingham, engineer. A new or improved projectile.

1872. W. E. Evans, of Sheffield, musical instrument maker. Improvements in harmoniums, concertinas, organs, and other similar keyed instruments.

1873. J. Jackson and A. Fisher, of Sheffield, manufacturers. An improvement in the manufacture of hats.

1874. G. Halkerston, of Frenchie, Fife, millwright. Improvements in mangles.

1875. J. Norton, of Rosherville, Kent, late Capt. 34th regiment. Improvements in projectiles.

1876. F. Shaw, of Derby, silk throwster. Improvements in spindles for the spinning of silk and other fibrous material.

1877. G. Mills, of Queen's-road, Regent's-park. Improvements in machinery for cutting wood for staves.

1878. D. Lichtenstadt, of Surrey sq., Old Kent-road, chemist, and C. Duff, of Hill-st., Peckham, gentleman. Improvements in treating tan and tanning refuse to obtain valuable products therefrom. A communication.

Dated August 18, 1858.

1879. J. Luis, of Welbeck-st. A new safety system for preventing an accidental discharge in fire-arms. A communication.

1881. W. Soelman, of Bennett-st. Additional improvements in the construction of propellers, chiefly with reference to his former patent, dated 20th August, 1855.

1882. T. Williams, of Aberdaron, North Wales, engineer. An apparatus to be used for a churn or for a washing machine.

1883. R. Anderson, of Black Braes, North Britain, engineer. Improvements in stuffing boxes and packings.

1884. T. O. Duke, of Kennington. Improvements in preparing cheques and such like documents, and in the means of preventing forgery or surreptitious alterations.

Dated August 19, 1858.

1885. A. Pilbeam, of Lonsdale-place, Notting-hill, architect. A bradawl screw.

1886. W. Hudson, of Burnley, Lancaster, machinist, and C. Catlow, of Clithero, overlooker. Certain improvements in looms for weaving.

1887. W. F. Padwick, of Hayling Island, Hants, gentleman. A machine or implement to be employed on land sown with turnips, to protect them from the ravages of the fly, applicable also to the protection of other crops.

1888. J. C. Plomley, of Maidstone, gentleman. An improvement in joists and laths used for supporting hair and other pervious floors in oast houses.

1889. M. F. J. Delfosse, of Regent-st., gentleman. Improvements in electro-magnetic machines.

1890. W. Smith, of Salisbury-st., Strand, civi engineer. Improvements in steam engines. A communication from H. W. Gullett.

Dated August 20, 1858.

1891. W. Pearce, of Bristol, surgical instrument manufacturer. Improvements in the manufacture of air-tight bottles, jars, or similar articles.

1892. W. A. Munn, of Feversham, Kent, major in the East Kent Militia. An improved method of constructing railway carriages, whereby greater safety is insured in case of collision.

1893. F. Preston, of Manchester, mechanical engineer, and W. McGregor, of the same place, mechanic. Improvements in machinery for cutting files.

1894. H. Hood, of Leeds. Improvements in the manufacture of railway tyre bars, boiler plates, bar iron, and forgings.

1895. L. F. H. Droinet, of Paris, engineer. Im-

provements in bearings and packings for rotating and reciprocating shafts, the joints of pipes, and other like purposes.

1896. P. Spence, of Pendleton, manufacturing chemist. Improvements in the manufacture of alum.

1897. J. L. Figgett, of Walworth, surgical turner. An improved construction of syringe or hand pump.

1898. W. Clay, of Liverpool, and E. L. Benzon, of Sheffield, steel manufacturers. Improvements in the manufacture of iron and steel.

1899. T. Knowles, of Gomersal, York, machine maker. Improvements in looms for weaving. A communication.

Dated August 21, 1858.

1901. F. F. Delpy, of Paris, jeweller. Improvement or improvements in metallic stay buses.

1905. W. Henson, of Saint Just, France, engineer. Improvements in circular looms or knitting frames.

1907. R. Laming, of Hayward's-heath, Sussex Improvements in purifying gases and liquids, in preparing purifying liquids, and in apparatus for apportioning or measuring liquids.

Dated August 23, 1858.

1909. F. Puls, of Haverstock-hill, chemist. Improvements in the distillation of coal.

1911. M. R. Pilon, of Aguascalientes, Mexico, merchant. Improvements in the manufacture and construction of fire-arms, and in the means of loading the same.

1913. L. Higgins, of Jersey City, and A. Brown, of New York, mariners. Improvements in reefing the sails of navigable vessels.

1915. T. Averill, of Birmingham, tea dealer. An improvement or improvements in mills for grinding. A communication.

1917. J. H. Robinson, manager to Grant Brothers, of Clement's-court, City, manufacturers. An improved shirt.

1919. A. Rottman, of Lawrence-lane, City. Improvements in fastenings for bags, porte-monnaies, pocket books, and similar articles. A communication.

Dated August 24, 1858.

1921. H. B. Barlow, of Manchester. Improvements in self-acting lubricators. A communication from D. H. Ziegler.

1923. H. Wilson, engineer, in the employment of Powis and James, of Watling-st. Improvements in the mounting of band saws.

1925. J. Biggs, of Leicester, manufacturer. Improvements in the manufacture of caps, resembling in form the Turkish fez.

PATENTS APPLIED FOR WITH COMPLETE SPECIFICATIONS.

1971. M. A. F. Mennons, of Paris. Improvements in the supports of rails for railways. A communication. Dated 31st day of August, 1858.

1977. J. H. Johnson, of Lincoln's-inn-fields. Improvements in the prevention of steam-boiler explosions. A communication. Dated 31st day of August, 1858.

NOTICES OF INTENTION TO PROCEED.

(From the "London Gazette," September 7th, 1858.)

890. P. E. Aimont. "Railway signalling."
904. A. S. Stocker. "Boots and shoes."
912. L. Newton. "Cop tubes."
926. E. White. "Indexes."
933. M. Moss. "Petticoats."
942. M. A. F. Mennons. "Combining silk with other substances." A communication.
943. B. Martin and C. J. Light. "Railway turntables."
949. A. Winkler. "Printing on metallic plates."
961. J. Chadwick, A. Elliott, and W. Robertson. "Twisting and winding silk."
968. G. H. Ellis. "Cleaning boots."
973. A. Smith. "Valves."
976. R. Illingworth. "Safety valves."
984. E. S. Trower. "Treating flax," &c.
985. J. Taylor. "Fire-places."
987. W. Clark. "Treating matters in a state of fusion." A communication.
991. H. L. Meall. "Spring fastenings."
1002. D. E. Hughes. "Transmitting signals."
1014. W. Clark. "Bits for bridles." A communication.
1020. J. Castle. "Carriage breaks."
1023. J. M. Duvard. "Vase."
1032. W. Clark. "Sharpening saws." A communication.
1038. R. B. Goldsworthy. "Grinding emery."
1044. J. M. E. Masson. "Diving apparatus."
1101. H. Curzon. "Printed yarns."
1118. W. E. Newton. "Marine engines." A communication.
1166. C. F. D. Monnin. "Rivets, screws," &c. A communication.
1202. M. A. F. Mennons. "Aperient biscuit." A communication.
1248. T. Scholefield. "Gas meters."
1295. A. Rigg, sen., and A. Rigg, jun. "Upsetting coals, &c.; brake machinery."
1654. C. Gammon. "Envelopes."
1772. W. Clay. "Metallic hoops," &c.
1783. D. McCrummen. "Paper; alkaline and other salts."
1788. A. V. Newton. "Lace." A communication.
1810. H. Clayton. "Bricks and tiles."
1861. C. O'Neill. "Artificial gums."
1886. W. Hudson. "Looms."
1925. J. Biggs. "Caps."
1971. M. A. F. Mennons. "Railways." A communication.

The full Titles of the Patents in the above List can be ascertained by referring back to their numbers in the Lists of Provisional Protections previously published.

Opposition can be entered to the granting of a Patent to any of the parties in the above List who have given notice of their intention to proceed, within twenty-one days from the date of the Gazette in which the notice appears, by leaving at the Commissioners' office particulars in writing of the objection to the application.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

1975. F. C. Calvert.
1988. W. H. Zahn.
1995. C. and J. Clark.
1998. W. H. James.
1999. T. T. Coniam.
2009. G. Collier.
2011. J. H. Glassford.

LIST OF SEALED PATENTS.

Sealed September 1st, 1858.

415. E. H. C. Monckton.
418. G. and J. Kirkley.
423. W. H. Graveley.
425. G. A. Biddell.
434. P. Moore.

439. H. G. Collins.
445. C. F. Parsons.
447. C. R. Moate.
451. J. S. Nibbs and J. Hinks.
452. C. C. de St. Germain.
455. E. Burke.
464. J. H. M. Maissiat.
467. T. Lyne.
472. W. Clark.
502. W. Pearson.
514. J. Jameson.
570. J. M. May.
990. W. H. Morrison.
1068. J. West.
1112. H. Walker.
1360. B. Atwater.

Sealed September 3rd, 1858.

484. W. Harding.
485. G. S. Andrews.
495. F. E. D. Hast.
497. J. Worrall and C. Race.
499. J. Warburton.
506. J. T. Coupier.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions.

NOTICES TO CORRESPONDENTS.

The letters of Mr. Hart, Mr. Cheverton, Observer, and some others are unavoidably deferred. We have also been compelled to allow Mr. Armstrong's paper on Water-Pressure Machines and Mr. Cockle's on Incongruous Solutions to stand over. Mr. Meyer's communications are necessarily refused.

Articles and Correspondence designed for insertion in the ensuing Numbers of the *Mechanics' Magazine* must reach the Office by the Tuesday of each week, at the latest. It is highly desirable that they should be forwarded earlier if possible.

CONTENTS OF THIS NUMBER.

LONDON: Printed and Published by Richard Archibald Brooman, of 166, Fleet-street, in the City of London. Sold by A. and W. Galignani, Rue Vivienne, Paris; Hodges and Smith, Dublin; W. C. Campbell and Co., Hamburgh.

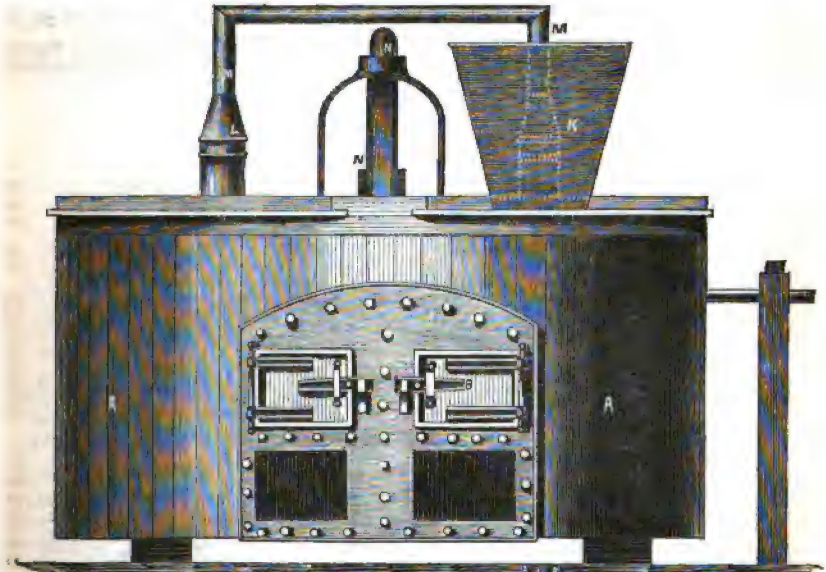
Mechanics' Magazine.

No. 1832.] SATURDAY, SEPTEMBER 18, 1858. [Price 3d.

Edited by R. A. Brooman and E. J. Reed, 166, Fleet-street, London, E.C.

PARSONS' PATENT MACHINERY FOR PRODUCING AND REVIVIFYING ANIMAL CHARCOAL.

Fig. 1.



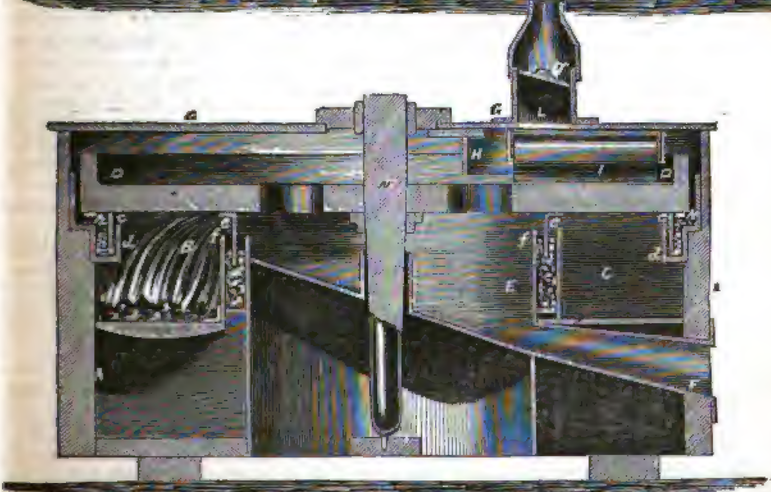
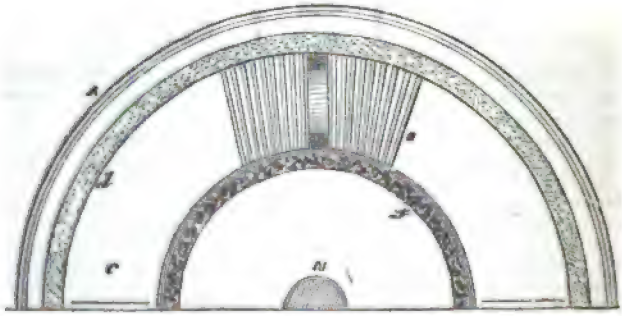


Fig. 2.

PARSONS' PATENT MACHINERY FOR PRODUCING AND REVIVIFYING ANIMAL CHARCOAL.

MR. CHARLES F. PARSONS, engineer, of Duke-street, London, has just completed a patent for an arrangement of machinery the object of which is to obtain an extended surface whereon to expose the bones to be burnt or the charcoal to be revivified, and from which the atmosphere is excluded, in order to prevent combustion of the bones or charcoal. The machinery is illustrated in the engravings on the preceding page, fig. 1 being a front elevation; fig. 2, a vertical section; fig. 3 on this page is a partial horizontal section through fig. 2. It consists of a circular frame, A, A, in the lower part of which are fixed the furnaces, B, B, and by flues, C, C, the heat is passed round the frame and into a chimney or shaft common to both or all of the flues. Over the furnace and flues there is a metal disc or platform, D, with a partial circular aperture, and the bottom rings or flanges, *c*, *c*, which are attached to the edges of the disc or platform, D, are free to revolve in sand troughs, *d*, *d*. Other flanges or rims, *e*, *e*, revolve in additional sand troughs, *f*, *f*. The aperture opens into a fixed spout, E, leading to the side of the frame, the outlet, F,

Fig. 3.



being closed by a tight-fitting door or valve. There is a cover, G, fitted perfectly tight over the revolving platform, D. Spreaders, H, H, and spreading rollers, I, I, are fixed between the cover and the upper surface of the platform for the purpose of distributing the material to be operated upon evenly thereon. The feeding hopper, K, extends down through the cover nearly to the surface of the platform; it is fitted with a valve or slide to prevent the access of air. Two or more ventilating pipes, L, L, are fitted into the cover, and are provided with valves, *g*, *g*, opening outwards, for the purpose of allowing the escape of the matters given off by the material under treatment; and for convenience these valves communicate through pipes, M, M, with the furnace shaft. The platform is connected to a central shaft, N, and rotary motion is communicated through teeth, *h*, *h*, formed on the underside of the edge of the platform in gear with a small toothed wheel on the shaft, O, passing through the side of the apparatus, and supported in bearings formed in the support, P, which shaft, O, receives motion from any prime mover: or motion may be communicated to the shaft, N, by any of the well-known means now adopted. As soon as the matters have been sufficiently exposed to the action of the heat on the platform, D, the matters are guided off the platform down into the central spout, E, to be withdrawn from the machine. On commencing operations a gas or other flame or agent may be introduced to consume or draw off all the oxygen which may be inside the machine.

SIR ISAAC NEWTON.—An imposing ceremony is announced to take place at Grantham on Tuesday next, the 21st inst., on the occasion of the inauguration of a monument to Sir Isaac Newton. Lord Brougham is to deliver the inaugural address, and amongst those who are to participate in the proceedings are the undermentioned:—Dr. Whewell, Master of Trinity; Professor Graham, Master of the Mint; the Lord Bishop of Lincoln; the Right Hon. the Earl of Harrowby; Sir Charles Eastlake; Major-Gen. the Hon. Sir E. Cust, K.C.B.; Robert Stephenson, Esq., M.P., &c. There will be a procession to the site of the statue on St. Peter's Hill, and after the inaugural address the Mayor will present to Lord Brougham a copy of "The Principia." At the conclusion of the out-door ceremony, a *déjeuner* will take place at the Exchange Hall, for which many tickets have already been taken. About £1,400 has been subscribed towards the cost of the statue, and we understand that only about £50 more is required.

MR. W. G. ARMSTRONG, C.E., F.R.S., ON WATER - PRESSURE MACHINERY.

The first paper read at the meeting of the Institution of Mechanical Engineers which was recently held in Newcastle was a highly entertaining history of his own experiences and improvements in connection with "water-pressure machinery," (as he was pleased to term it) by that able engineer, Mr. W. G. Armstrong, of the Elswick Engine Works. This subject was first pressed on his attention about twenty-three years ago, by noticing a small stream of water which flowed from a great elevation down a steep declivity, and turned a single overshot wheel near the end of its course. Observing that the portion utilised was not more than a twentieth part of the whole descent, he was forcibly struck with the inadequacy of the wheel as a means of realising the power of such a fall; and, conceiving it practicable to render the entire head available by bringing down the water in a pipe, and causing it to act by pressure upon a suitable machine at the bottom, he applied himself to devising an engine to be worked by such a pressure.

Other inventors had been previously led to apply water pressure to the propulsion of machinery, but with these applications Mr. Armstrong, who was not then an engineer, was wholly unacquainted.

After meeting with many difficulties and discouragements, as is usual in such cases, a machine was produced, a species of rotatory engine, admitting of a continuous and uniform flow of water through it, and exempt from all contracted passages. It was tried first in Newcastle, with the pressure from the street pipes, equivalent to a column of about 200 feet; then in Gateshead, with a still greater pressure; and in both cases it yielded a very high effect in relation to the theoretic power of the moving column.

He next conceived the idea of applying such power to the cranes at that time so slowly and expensively worked by hand. Accordingly a working model of a hydraulic crane was constructed, and exhibited at a meeting of the Literary and Philosophical Society of Newcastle, where it was connected with the town water pipes, and went through the several operations of lifting, lowering, and slewing, in a most satisfactory manner.

The next step was to carry this scheme into actual practice, and accordingly, in the year 1846, the first hydraulic crane was erected at the upper end of the Newcastle Quay, where it has ever tince continued to do good service in discharging ships.

Mr. Armstrong was soon enabled to introduce his crane at Liverpool, and shortly afterwards at the New Dock at Grimsby, where, at the instance of his friend, the late Mr. Rendel, the engineer who constructed that dock, he also applied the same kind of machinery to the opening and closing of the lock gates and sluices.

An extensive system of water-pressure machinery was accordingly carried out at that dock, and the result afforded the first practical demonstration that the pressure of a column of water could be advantageously applied, as a substitute for manual labour, not merely for cranage of goods, but also for various mechanical operations in connection with the entrances to docks.

In order to get rid of the difficulties found to result from variations of pressure in the street mains (as the erection of a tower for that purpose was a formidable undertaking), he resorted to another form of artificial head, which possessed the advantage of being applicable, at a moderate cost, in all situations, and of lessening the size of the pipes and cylinders, by affording a pressure of greatly increased intensity. The apparatus by which this was effected was named the "accumulator," a reservoir giving pressure by load instead of by elevation; and its use, like every provision of this kind, is to equalise the duty of the engine in cases where the quantity of power to be supplied is subject to great and sudden fluctuations.

The introduction of the accumulator in 1851 removed all obstacles to the extension of water-pressure machinery, which has since been applied in nearly all the principal docks, and in many of the Government establishments in this country. Nearly 1,200 hydraulic cranes, hoists, and other machines of that character have been applied, and 125 steam engines, collectively of more than 3,000 horse power, are now daily at work to supply the pressure for working them.

The system has also been adopted in many of the principal railway stations, not only for cranage, but also for working turntables, traversing machines, wagon lifts, hauling machines, &c. It is also extensively used for raising and tipping wagons in the shipment of coal, for opening and closing swing bridges, and for many other purposes which it would be tedious to enumerate. In fact, new forms of application are continually being developed, and no doubt can be entertained of its capability for further extension.

The form of mechanism which prevails to the greatest extent in these various applications of water pressure consists of a press with a set of sheaves used in the inverted order of blocks and pulleys, the object being to obtain an extended motion in a chain from a comparatively short stroke

of a piston. To meet variation of load, it was the former practice to combine three of these presses so as to act either separately or collectively upon the chain, but Mr. Armstrong has more recently introduced a method by which a variation of power is obtained by a single-bored cylinder, fitted with a combined piston and ram. For the lower power the water is admitted to both sides of the piston, in which case the power exerted and the water expended are each proportionate to the area of the ram. For the higher power the upper side of the piston is thrown open to the exhaust, and the result, both as regards power and expenditure, is then proportionate to the full area of the cylinder. It is seldom necessary to have more than a double power, but in cases where a third or lower power is required, a smaller ram may be inserted within the other; but in this case it is necessary to made fast the larger ram while the smaller one is at work.

In hydraulic cranes the power is applied not only for lifting the load, but also for swinging the jib; which latter object is effected by means of a rack or chain operating on the base of the moveable part of the crane, and connected either with a cylinder and piston, or with two presses applied to produce the same effect by alternate action.

The absence of any sensible elasticity in water renders the motions resulting from its pressure capable of the most perfect control, by means of the valves which regulate the inlet and outlet passages; but this very property, which gives so much certainty of action, tends to cause shocks and strains to the machinery, by suddenly resisting the momentum acquired by the moving parts. Taking, for example, the case of a hydraulic crane swinging round with a load suspended from the jib, the motion being produced by the water entering upon the one side of a piston and escaping from the other, it is obvious that, if the water passages be suddenly closed, the piston would be brought to rest so abruptly as to cause, in all probability, a fracture of the machine. But this liability is effectually removed by applying, in connection with the water passages, a relief valve, consisting of a small clack valve, opening upwards against the pressure, so as to permit the pent-up water in the cylinder to be pressed back into the pipe whenever it becomes subject to a compressive force, exceeding the pressure yielded by the accumulator. By this means all jerks and concussions are avoided, and a perfect control over the machine is combined with great softness of action.

The method which Mr. Armstrong has most generally adopted for opening and closing dock gates, by means of hydraulic pressure, is by applying to each gate a pair of cylinders, with rams and multiplying sheaves similar to those constituting the hoisting apparatus in hydraulic cranes. One of these cylinders opens and the other closes the gate. They are placed in chambers beneath the surface. Mr. Armstrong has also, in some instances, adopted for this purpose another method, which has been found to answer extremely well. Instead of connecting hauling cylinders with each gate, a line of shafting, driven by a small hydraulic engine, is laid beneath the surface, parallel with the coping, and by means of clutch work is thrown into or out of gear with each gate crab.

The hydraulic engines most recently constructed for driving the shafting consist of a combination of three oscillating cylinders, with slide valves, very simply arranged.

In nearly all cases in which hydraulic pressure has been applied for the moving of dock gates, it is also used in opening and closing the levelling shutters, and in many cases, also, for working the capstans. The former purpose is effected by the direct application of a cylinder and piston fixed above the shutter, and the latter is accomplished by throwing the capstan into gear with the shafting, or by applying to it a separate engine similar to that which has been described.

A good example of the application of hydraulic pressure to the opening and closing of scouring shutters may be seen at Sunderland Docks, where, by means of this power, the enormous area of nearly 500 feet is opened in a few seconds and closed with equal rapidity.

At the same place an example may also be seen of a heavy drawbridge, worked by water pressure. The bridge is supported upon wheels, and is first lifted from its bearings to such a level as to enable the wheels to roll back upon a suitable railway, both operations being performed with great steadiness and rapidity by the action of the water.

In working swing bridges by means of water pressure, a central press is applied to lift the entire bridge clear of its supports, and it is then turned by an application similar to that used for slewing a crane. The most remarkable specimen of a bridge of this description is one erected by Mr. Armstrong at Wisbeach, under the direction of the late Mr. Rendel. The power is derived from an accumulator charged by hand labour, and it is expected that one man, by continued working, will be able to store up sufficient power for opening and closing the bridge as often as necessary. This system of using an accumulator in connection with a hand force-pump has also been success-

fully applied to a drawbridge erected by the writer near Carmarthen, on the main line of the South Wales Railway, and it might be advantageously adopted for many other purposes requiring a concentrated execution of power with intervening periods of inaction.

Amongst the numerous applications that have been made of water pressure for the purpose of rapidly lifting and lowering heavy loads, there is one which calls for special remark on account of its growing importance. This is the application of hydraulic pressure in connection with an accumulator for working vertical hoists at the landing stations of steam ferries, in cases where a railway traffic is required to be passed over a river or estuary not easily crossed by a bridge. The traffic of the Aix-la-Chapelle, Dusseldorf, and Ruhort Railway is, by this means, shipped and unshipped at the ferry across the Rhine, and such is the rapidity and facility of the operation, that a train of twelve coal wagons, weighing collectively 133 tons, can be transferred from the deck of the steamer to the railway, being a height of about feet, in twelve minutes. Each hoist lifts two wagons at a time, and raises its load in ten or twelve seconds. These hoists are so arranged as always to accommodate themselves to the level of the boat, and always to stop at the exact level of the railway.

(*To be continued.*)

COAL-BURNING LOCOMOTIVES.

THE following is the chapter on coal-burning locomotives to which allusion was made in our last Number:* "In Europe, as in this country (America), bituminous coal is naturally the staple locomotive fuel. The success with which it is used in its raw state has been seen. English coal-burning boilers are not interesting from their variety; for, while ours, in distinct plans, number a score, they are but three or four. But these combine principles which have been quite overlooked in most of the contrivances in this line in which American inventive genius has been so fruitful. These principles are—the admission of air in divided streams over the fire; means for deflecting this air into thorough mixture with the gas; means of igniting the compound, and space for it to expend itself in flame. No possible arrangement of bent or upright tubes, shaking grates, sub-treasuries, variable exhausts, or smoke-box details of whatever nature, can supply the absence of these vital provisions. With scarcely an exception, American coal-burning boilers have been wanting in *comprehensiveness*, each having a one-idea character, a torturing of a single hobby into an all-in-all importance; and hence, while *each* patent proprietor claims perfection for his own bantling, all are deficient, and the main question for a cautious railway manager is, 'Which is *worst?*' One inventor takes for granted that the whole difficulty rests in deficient circulation, and accordingly comes out with water tubes, in which ebullition is to go on at a rate to which that in the witches' cauldron in *Macbeth* would bear no comparison. Another discovers that coal would burn in the most satisfactory manner but for the unprotected ends of the tubes. The fistular arrangement is sent forthwith to the right-about, each member being cut in three, and the whole being packed vertically in a square boiler. Another traces the whole matter to the smoke-box, and, observing how necessary it is that the coal shall not pass through the chimney *in bulk*, sets up a diaphragm of wire-cloth, with a spout and a 'sub-treasury' beneath, and thus at a stroke sets the vexed problem at rest. With all these plans, the mischief is, that, whatever the special merit of each in surmounting some particular difficulty, it is insisted upon by its owner as a complete and matured 'coal-burning boiler,' and we are duly favoured with its evaporation of from 9·999 to 19·999 pounds of water per pound of coal, and with the record of its insignificant repairs, and of its very inconsiderable consumption of fuel, &c.; sufficiently satisfactory, indeed, to close all further discussion of coal-burning as a practical problem, and leaving nothing to be done beyond the trifling alteration of some 9,000 or 10,000 locomotives to the new standard, and the cheerful payment of a petty million or so by way of patent right. It is the misfortune, not the fault, of patentees, that the most vital arrangements of a coal-burning furnace are none of them patentable, but it is hardly in keeping with the compromising spirit of the times, that the inventive fraternity will not lump the undisputed fruits of their genius already patented in a single coal-burning boiler, and thus intensify perfection itself. Little enough are they likely, however, to do this, for they take the most determined ground against each other, and hence the railway public are doomed to the sad contemplation of a perfection to which they may not attain. Quietly threading its way among all the rubbish clamouring so pretentiously for favour, there appears here and there a rational conception of a coal-burning boiler. The combustion-chamber, although patented in England in 1846, acquired its notoriety

* Mr. Colburn is about to prepare an English edition of his work, if gentlemen will subscribe for 400 copies at £2 each.

from its use by McConnell some time in 1852. In this country (America), however, A. F. Smith, Esq., then of the Cumberland Valley-road, specified it in 1851, in engines then building for him at Boston. At the same time he specified the steam-jet or blower, now indispensable in all coal-burners. In 1852, Mr. Smith's engines were completed, combining both of these arrangements, which have remained in use, without change, to this time. As superintendent of the Hudson River-road, Mr. Smith has altered eleven engines to burn coal, the first having come out in the autumn of 1856. The alterations as now made may be stated as follows, for an engine of 16 in. by 22 in. cylinders: The furnace is made 5 feet long on the grate; 2 feet in height around the bottom being of copper, the rest of iron. The water spaces are 3 in. at the sides and back, and 4½ in. in front. The grates are stationary (not rocking), and are closed up for one-half their length, at their front ends. There are 20 hollow stays of 1 in. bore through the back water space, at just above the level of the fire, the coal being carried from 10 in. to 14 in. in depth on the grate. A combustion chamber extends 5½ feet into the boiler. A 'mid-feather' or water space, 4 in. thick, divides this chamber vertically, extending also to within 2½ feet of the tubes. A fire-brick wall is built into the mouth of the combustion chamber on each side of its middle water space, extending up to within 12 in. or 14 in. of the roof, and projecting into the furnace. There are 210 brass tubes 1¾ in. in diameter, and 6½ feet long. Such engines are taking daily from five to nine eight-wheel cars, on both way and express trains of from 30 to 40 miles an hour, with an average of 24 pounds of coal per mile, making very little smoke excepting when standing or firing, maintaining steam steadily at from 100 to 110 pounds; the exhaust being a single nozzle of 4¾ in. diameter, while the furnaces show no injury by burning or leaking. At the present rate of saving, the fuel bills of the road for the current year will be 60,000 dollars less than with wood. In running the engines with coal, a single shovelful only is put on at one firing; this being thrown well over the fire or upon thin places. This mode of firing has proved by far the best, giving the least labour, requiring the least disturbance of the fire, and making the least smoke. The deflector and outer chimney are yet retained, although but very little dirt is removed daily, what is caught being in very fine dust. To perfect these engines, further arrangements for introducing and mixing the air, and for deflecting the rising sparks away from the tubes, should be liberally provided. Mr. Smith has lately introduced what promises to become an excellent mode of admitting and dividing the air. The grates are cut 2 in. short of the back or door end, and a sheet of iron is set up 2 in. from the water space, and extending nearly up to the door. This is perforated with a great number of small air-holes. The air, having free access from below, excepting when shut off by a damper, is diffused upon the fire at the points and in the manner most favourable for saturating the gas. It has been the object of several arrangements to equalize the draft through tubes. In an ordinary boiler the flame rises naturally to the upper part of the furnace, from whence its shortest and hottest course of escape is through the upper tubes. As early at least as 1848, Winans set up a pipe in a smoke-box, say 9 in. or 10 in. in diameter, and extending, from opposite the lower tubes, upwards and for a few inches into the chimney. The exhaust nozzle being at the bottom of this pipe, a draft was there produced, drawing through the lower tubes; while the draft also through the annular openings between the upper end of this pipe and the bottom of the chimney, drew upon the upper tubes. This pipe has been since modified and extensively used, being divided into sections, and known as the 'petticoat pipe.' Ten years ago, also, upon the Philadelphia and Columbia Railway, the enginemen (running engines burning coal and wood together) found it necessary to place a sheet-iron partition nearly across the smoke-box, and between the ends of the tubes and the exhaust pipes. This was to prevent hot coals from banking up and burning out the smoke-box. An annular opening was left between the edge of this sheet and the inner circumference of the smoke-box, to permit the draft to pass through. This arrangement, although not designed originally for the purpose, was found to equalize the draft through the tubes, and it has been lately resumed and is already in upwards of one hundred engines. Mr. Smith has used, in a considerable number of engines upon the Cumberland Valley and the Hudson River railways an ingenious plan of equalizing, and, at the same time, of increasing or diminishing the draft in the tubes. Inside of the ordinary chimney he places a sliding section of pipe, about 4½ feet long, and contracted to about 11 in. in diameter, for about 20 in. of its middle length—what would be known in hydraulics as a *vena contracta*. This pipe is adjusted at pleasure, so that its lower edge may be dropped more than halfway down the smoke-box, or raised to near the base of the chimney. When dropped it insensibly increases the strength of the draft, besides bringing it more directly through the lower

tubes. It is very easy, even with but partial and imperfect arrangements, to burn soft coal with a very considerable degree of success. This fact, indeed, is all there is in favour of most of the patented schemes wherein a single detail, like that of water tubes or of a modified grate or anything equally irrelevant, is magnified into a 'coal-burning boiler,' claiming to combine every arrangement for the mixture, ignition, and complete combustion of the gaseous and solid elements of the coal with air. Hence, also, the mere interposition of an arch of fire-brick projecting horizontally backward into the furnace from just below the tubes, has enabled two or three eastern railway companies to substitute coal exclusively in place of wood, in all their engines. There are required hardly ten dollars to convert a wood engine into a full-fledged coal-burner. Those unprepared to go further should at least lose no time in adopting the fire-brick arch of Mr. Griggs, although no one conversant with the conditions of coal-burning can reasonably expect to fulfil them completely by so partial an arrangement. No other reform so great as that of the fuel bills of our railways rest upon so few, so simple, and so entirely available conditions as those of burning coal without smoke. While we have observed the simple laws which science has indicated for our guide, practice, so omnipotent with practical minds —a practice more intelligent and successful our own—has proved their absolute correctness."

It will be well for us here to record what has very lately been done in this country in the promotion of this subject, and in doing so we must refer to a report which has been forwarded to us, and which has likewise been sent to, and published by, some of the morning papers. The complete and perfect success of Mr. Beattie's coal-burning locomotive was fully described in Mr. Daniel Kinnear Clark's paper in the *Mechanics' Magazine* for Nov. 29, 1856, No. 1738.

The directors of the Lancashire and Yorkshire and East Lancashire Companies (the management of which is now so closely united that they are practically the same corporation) have, however, it is said, been aiming to accomplish the object by a simpler and cheaper means than that of adapting the features of the Beattie locomotive to existing boilers. It is stated that the lines under the control of the two boards are nearly 400 miles in length, that they employ about 300 locomotives, and that the saving to be effected by using coal instead of coke would be at least £30,000 per annum. Mr. Jenkins and Mr. Lees, the locomotive superintendents of the two companies, have each perfected simple and inexpensive inventions. That of Mr. Lees (of the East Lancashire) was put to the test on Monday, the 6th inst., on the railways between Manchester and Blackpool. Mr. Lees and Mr. Jenkins were, of course, present, and associated with them to test the apparatus scientifically was Mr. B. Fothergill, the eminent consulting engineer of Manchester. Mr. Fothergill had the entire charge of the experiment, having been retained professionally by the company for that purpose, and to report upon a series of similar experiments in which he has been engaged during some months past. The results of the trip, which was made with a heavy train, were most satisfactory. The coal used was that of the Ince-hall Company, at Wigan, costing 5*s.* 3*d.* per ton; and the cost of the trip (over 96 miles) was about 10*s.* From experiments previously made, it appeared that, with coke, which costs from 11*s.* to 11*s.* 6*d.* per ton, the expense of taking the same train the same journey would have exceeded 20*s.* In two previous trials made by Mr. Fothergill—one with coal and the other with coke—over the same line, weather and circumstances being equally favourable to each, the cost was 9*s.* 5*d.* for the experiment with coal, and £1 2*s.* 3*d.* for that with coke. There seems to be no doubt, therefore, of the advantage of using coal, in point of economy. As regards the smoke-burning apparatus, also, the experiment was satisfactory. One great desideratum is the proper admission of atmospheric air into the fire-box, and Mr. Lees secures it as follows:—In the lower part of the fire-box door an opening is effected by an adjustable plate, and the admission of air can be regulated as desired. Inside the door is a hood, closed at the top over the aperture, and it acts as a deflecting plate to the air when admitted, and forces it down upon the fire. Nearly at the further end the fire-box is arched over with fire-bricks or tiles. The effect of the brick arch is, that on becoming red hot it throws back the products of combustion, and thus causes a better mixing of the gases. If more desirable, the arch or mid-feather might be constructed of copper, with a water-space, so as to increase the heating surface of the boiler. The cost of the whole apparatus is only a few pounds per engine, and a sum of about 20*s.* per annum will be sufficient to keep each of them in repair. The directors of the East Lancashire Company have been so satisfied with its efficiency that they have adopted it all but universally, only two of their locomotives being now without it. The gentlemen accompanying the experi-

mental trip on Monday expressed their approval unreservedly. Throughout the journey there was no smoke emitted from the chimney that could be considered a nuisance, or anything approaching to a nuisance, by passengers or the public generally. There was occasionally a slight discoloration of the steam when more coal was added to the fire than is usually applied at one time, and the same is the case with coke; but the effect disappeared in a moment or two. The little smoke that does from time to time escape unconsumed, when beaten down and confined by passing under a bridge or through a tunnel, is less sulphurous than coke; nor is it accompanied by such a cloud of small, sharp, blinding particles. If it could become offensive anywhere it would be when the train comes to a stand in enclosed stations, and when the steam is shut off; but a contrivance by which a jet of steam is thrown into the chimney during such stoppages so nearly dissipates it, or prevents its formation, that the small quantity emitted is scarcely perceptible. There is another consideration which will influence railway companies to adopt some form of smoke-consuming apparatus, so that they may burn coal instead of coke. The wear and tear of fire-box and tubes is much lessened by the use of coal. In burning coke a large amount of sulphur is given off, which leaves a thick crust upon the tubes. This becomes so troublesome and destructive that engine-drivers are compelled to cleanse them at least once a-day, and sometimes even more frequently. Such incrustation cannot be removed without more or less injury to the metal, and the sharp, hard particles given out by coke fires, and draughted up the tubes, have the effect of cutting and wearing them away, especially at the edges. In burning coal the sulphur is supposed to pass off in a more volatile form, there is little or no incrustation, but the metal is found instead to be lubricated with a soft oily matter, which requires to be removed only about once a week. The economy in this respect will no doubt be considerable. During the experiments on Monday it was stated by Mr. Fothergill that the average duration of a set of tubes with coke was about 94,000 miles, while with coal he had seen a set in use, and apparently not half worn out, after travelling 156,000. The average with coal would probably reach 300,000 miles. The best kind of fuel yet tried during the experiments to the present time is said to be the Horbury coal. An experiment with Welsh smokeless coal entirely failed, the bars of the fire-box getting clinkered over, so that the engine could not proceed. On Tuesday an experimental trip was made over the same line of rails with the same train, but drawn by a locomotive having the smoke-burning apparatus invented by Mr. Jenkins, of the Lancashire and Yorkshire Company. This invention, which has been generally adopted by that company, is rather more expensive in its application than that of Mr. Lees, though still of very small cost; but it is also very effective. Mr. Jenkins admits atmospheric air into the fire-box through a number of tubes in front of the fire-box and underneath the boiler. The outer part of the fire-box is furnished with a sliding plate, which can be worked by the engine-driver at pleasure, so that, during the time of adding fresh fuel to the fire, by moving the plates the tubes are uncovered, and a good supply of oxygen is insured. He has also a perforated deflecting plate across the fire-box, to insure a better combustion of the gases, and prevent the escape of unconsumed carbon.

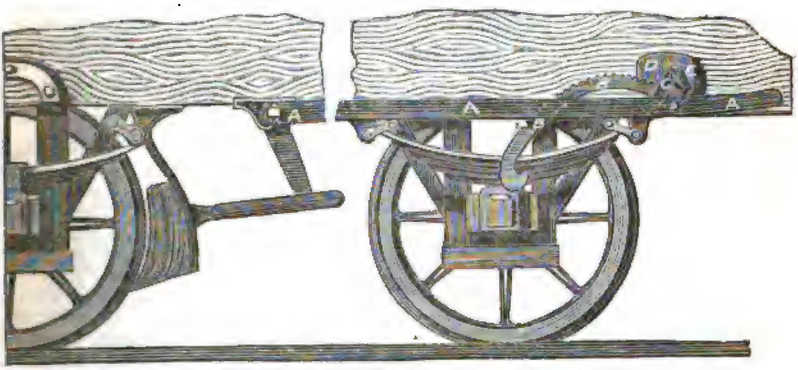
CHATTERTON'S PATENT TELEGRAPH CABLES.

Mr. J. Chatterton, of the Gutta Percha Works, has just completed a patent for an invention which consists in causing the wires or strands of wires to pass through a vessel fitted with suitable gauges, and containing an insulating compound of gutta percha or suitable material, rendered more or less fluid by the addition of solvents, and the application of heat immediately before the machine which puts on the ordinary covering of gutta percha. The patentee also electro-plates the copper wires which he employs for electric conductors, in order to render them more suitable to be used for this purose. He electro-plates the copper wire by causing it, after it has first been cleaned by pickling in the usual manner, to pass continuously through a silvering bath, the wire being at the same time in metallic connection with one pole of a battery, the other pole of which is connected with a plate of silver which is immersed in the bath, as is well understood. The object of electro-plating the wires is to prevent the oxidation of the copper wire. In long lengths of insulated telegraphic wire, he gradually diminishes the size of the conducting wires, so that, as the electric currents become weaker, they will have suitably sized conductors. This part of the invention is applicable to telegraphic wires through which signals are transmitted in one direction only.

JOHNSON AND STABLEFORD'S PATENT BREAK LEVERS FOR RAILWAY WAGONS.

The levers employed to apply and remove the break blocks for the wheels of railway wagons are now retained in the desired position by being thrust laterally into a notch made in a notched bar, known as a break guard or rack, affixed to the rear of the wagon on the sole and side rail. From the exposed position of this bar it is not only liable to be broken or damaged, but the lever is also liable to be pushed out therefrom; or, the levers have connected to them a bar with perforations, through which a pin is passed, in order to retain the lever in any desired position. In this latter case two operations are necessary to fix the lever and break: one is the depression of the lever, and the other the insertion of the pin to retain the lever in the position required.

Messrs. R. W. Johnson and W. Stableford, of Oldbury, Worcester, have patented an invention intended to remedy these inconveniences, and to the render one operation only necessary for applying the break and fixing it. It consists in connecting by a bolt, hinge, or pin, to the back part of the lever a bar cut with rack teeth on either edge, and made to pass through a guide on the sole or side rail of the wagon, and in fitting a paul in a convenient position for taking into the teeth on the bar. The bar may be either in the shape of a quadrant or segment, which, working through the guide, balances the break lever in position, and prevents it jumping off its seat; or the bar may be straight, and work in a groove in the body of the wagon.



The fig. shows a side view of so much of a railway wagon as is necessary for explaining the invention. A is the break lever, to which is attached by a bolt or pin the (say) segmental serrated bar, B. This bar, B, passes through and works in a guide or loop, C, bolted to or cast with a plate, D, fixed on the sole of the wagon. E is a weighted paul which, when the break is being applied, engages into the teeth on the bar, holds down the lever, and, consequently, keeps the break applied. To release the break, press down the lever, remove the paul, when the bar may be returned to the position shown.

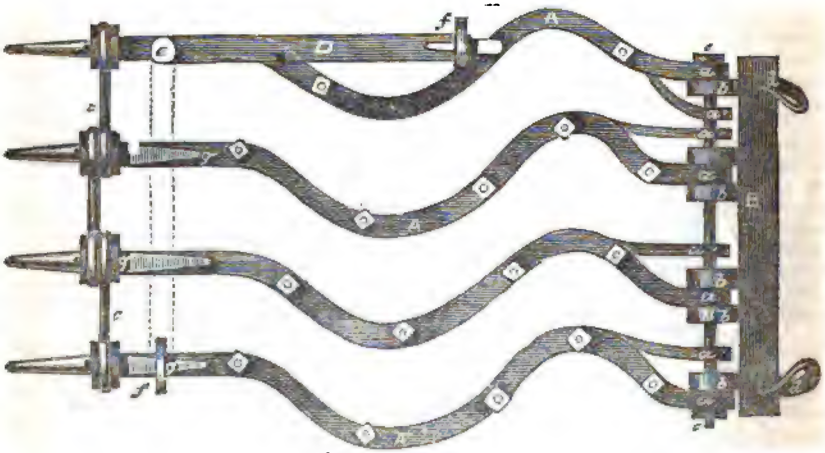
HENRY CORT'S INVENTIONS.

Mr. Richard Cort, in the indefatigable pursuance of his aim respecting the reward of his father's inventions, has issued a portrait of the late Henry Cort, and obtained for it the patronage of Her Majesty the Queen, who has commanded that the portrait be placed in the Royal Library, and also of His Royal Highness Prince Albert, who has possessed himself of a copy. We hope this royal patronage will stir up the British Association to move vigorously in the matter at the Leeds meeting, and that the Society of Arts will not be slow to follow the lead of their Prince President.

LYNE'S PATENT HARROW.

Mr. T. Lyne, of Malmsbury, Wilts, whose patent field-stile attracted a good deal of attention at the Royal Agricultural Society's meeting at Chester, is now introducing a new harrow of an improved kind, for which a prize and certificates of merit were awarded at the Bath and West of England Show, held at Cardiff. The new harrow is composed of two, three, or more beams of straight, curved, or zig-zag form, each connected by separate loops or eyes to a transverse draught bar. The beams carry the tines, and, being connected by eyes to the draught bar, they are free to play, both laterally and up and down, or either only. The draught hooks are also connected by eyes to the draught bar. There is a transverse bar, or there are transverse links near the rear end of the beams, to confine them within certain limits, but not to prevent any or all of them rising, and falling, and vibrating. The action of the harrow is such that, should any tine come in contact with a hard or large substance, the beam in which that tine is fixed rises, or moves laterally or both, to clear the impediment without disturbing or displacing the other beams. By curving the beams, or making them of a zig-zag form, the patentee is enabled conveniently to place the tines in such positions that several of them shall not lie in the same transverse or the same longitudinal line.

The annexed engraving represents in plan view the upper side of a four-beam harrow constructed according to the invention. A, A are the beams, which are curved in this harrow, and are each con-



nected by two loops or eyes, *a*, *a'*, to the loops or eyes, *b*, *b*, on the draught bar, B, by means of a transverse through bolt, *c*. *d*, *d* are the draught hooks in the draught bar, B. The rear ends of the beams, A, A, are formed into spindles to receive the links, C, C, which are slotted to allow for play when either of the beams rises. D is a flat bar centred at *e*, and placed as shown in drawn lines, when the harrow is at work, being held in that position by the screw, *f*; but, when the harrow is to be transported, and consequently requires to be made rigid for the sake of convenience, the bar, D, is turned into the position shown in dotted lines, sliding under all the holders, *g*, *g*, and is fixed there by the screw, *f'*. By placing an additional link on the outside beam on one such harrow, and connecting it to the outside beam of a neighbouring harrow, two or more such harrows may be conveniently connected for joint operation. The patentee places weights, which may be either of the same or of different sizes, on the respective beams of the harrow where desired.

The advantages offered by this implement will be at once manifest to practical agriculturists.

The Manufacture of Rods, Wire, &c. In our Magazine, No. 1827, for August 14th, we published in the list of provisional specifications *not proceeded with* the following patent:—"A. and H. Parkes. Improvements in the manufacture of rods, wire, nails, and tubes." Dated Jan. 1, 1858. (No. 5.) The patentees write to inform us that the specification of the patent was duly enrolled on the 27th May last. As our notice might prove prejudicial to their interests, or lead other parties to infringe, we take this early opportunity of correcting the error.

ON INCONGRUOUS SOLUTIONS.

By James Cockle, M.A., F.R.A.S., F.C.P.S., Barrister-at-Law.

(Continued from vol. lxvii., p. 325.)

Pure Arithmetic takes cognizance of number only. When the mark of subtraction is prefixed to one number it indicates an operation to be performed on another greater than, or at least equal to, the former. Number unconditionally subtractive is not recognized in Arithmetic. It involves the arithmetically impossible notion of numbers less than nothing.

However far we proceed in the Theory of Numbers, or in the generalization of arithmetic (ciphering) by the aid of symbols, the same limit is observed. The Arithmetic may be a generalized or universal, a specious, literal, symbolic or algebraic arithmetic, but, so long as the symbols are the representatives of numbers, it is an *arithmetic* still, though not of ciphers. Negative numerical symbols have, when isolated, no place in the science, which is one of Positive quantity only.

When, instead of treating them as mere representatives of numbers, we come to regard the symbols themselves, their laws and interpretations, we make the transition from Numbers to General Symbols, from *algebraic arithmetic* to Symbolical Algebra. Here Negative numerical quantity, or (if the expression be allowed) negative number, has, even though standing by itself, a recognized place.

An aggregation of positive and negative numbers gives rise to a result consisting of a single positive or negative term. That branch of symbolical algebra which deals with positive and negative quantities only is a Single Algebra. The singleness of result is a characteristic of arithmetic also, and, had not a distinguished authority used the term in a more restricted sense, the single might be called an *arithmetical algebra*. Positive and negative being comprehended in the technical name Real quantity, the Single is in this sense a Real Algebra.

Symbolical is not, however, synonymous with Real or Single Algebra. It embraces a species of quantity essentially different from either of those already mentioned, and which, not being "real," may be called Unreal. An aggregation of real and unreal quantities gives rise to a result consisting of, at most, two terms, and hence the name Double is used to denote this aspect of symbolical algebra.

An unreal (I use the word in preference to imaginary or impossible) quantity is the square root of a negative number.

In Arithmetic a pure negative quantity is regarded as impossible, number being essentially positive. In Real Algebra an unreal quantity is deemed impossible, because the square of a real quantity is essentially positive, and to speak of a negative square is to regard the same quantity as *simultaneously positive and negative.* But it will be observed that the square of a negative number is a number in the arithmetical sense, and the square of a monomial unreal quantity is real. In both cases the apparent impossibility disappears in the square. And even if we recognized an unconditionally Impossible quantity, a quantity (other than zero) simultaneously positive and negative, this impossibility, too, would disappear on squaring, and the square would be a real or unreal quantity.

Of these species of quantity (1) number is the direct result of which we are in search, and needs no interpretation; its significance appears from the *data* of the question; (2) negative number is unconditionally interpretable; (3) unreal quantity is conditionally interpretable; and (4) impossible quantity, if its existence be admitted, is either unconditionally uninterpretable, or must be made the subject of arbitrary or conventional interpretation. I shall illustrate this by example.

Ex. IX. A person's age two years hence will be three times what it was four years ago. What is his age? Answer (arithmetical), *Seven* years.

Ex. X. A person's age two years hence will be half what it was four years ago. What is his age? Answer (real, but negative), *Minus eight* years. This is interpreted by taking the reverse of time past, *i.e.*, time future. The answer tells us that "if an anticipated birth occur *eight* years from the present time, it will, two years hence, be only half as remote as it was four years ago."

Ex. XI. A person's age two years hence will be three times his present age less its square. What is his age? Answer (unreal),

$$(1 \pm \sqrt{-1}) \text{ years.}$$

This answer satisfies the algebraical conditions, but, time being of one dimension only, we have no such interpretation as that of which the unreal symbol is susceptible in geometry. We must have recourse to Sir W. Rowan Hamilton's Science of Pure Time.

Ex. XII. A person's age one year ago was equal to his age two years ago. What is his age?

Let his age $= x$; then

$$(1-1)x + 1 = 0$$

is the equation in x. One solution of this is

$$x = infinity,$$

and the other, if we call an absolute impossibility a solution,

$$1=0.$$

These are, at all events, the analytical conditions, and their interpretation is—"either, the person has existed from eternity, and the addition of a year to his term of duration does not arithmetically increase the number of his years; or, we are driven to the absolutely impossible supposition that unity is equal to zero." The answer is a disjunctive proposition, and x is either arithmetically infinite or absolutely impossible. Infinite and impossible solutions, though distinct, are complementary, and enter equations together, except in that undoubtedly existing case in which a surd equation is absolutely insolvible, rootless, impossible, and self-contradictory.

Let

$$n=-1, i=\sqrt{-1}, j=[\pm 1],$$

the square brackets [ ] denoting that the inclosed signs are to be given simultaneously to the 1. Then n is the negative and i the unreal unit, and the symbol j, constructed conformably with the analogies of real and unreal algebra, may be used to denote the (absolutely) impossible unit. Its occurrence in a problem may either express the impossibility of solving it, or indicate the conditions under which a solution is attainable.

The equation

$$w+ix+jy+ijz=0$$

leads to

$$w=0, x=0, y=0, z=0.$$

This may be readily demonstrated by, first, giving j its simultaneous values in succession; then, adding and subtracting the results; and lastly, equating the real and unreal parts separately to zero. The same result would have been obtained had we started with

$$[\pm\sqrt{-1}]=[\pm i]=i[\pm 1] \\ =ij=k$$

as the symbol of impossibility.

Reasoning with such symbols is beset with dangers of the same kind as those which encircle zero and infinity. They must be met with the same caution. Sometimes, indeed, the occurrence of j or k may, for practical purposes, be disregarded. Thus, if the solution of a problem be

$$x=w+jy,$$

and y be small, w will be an approximate value of x.

I do not propose entering here upon the application, interpretation, and laws of these symbols. My speculations upon the subject some years ago called forth the efforts of a man of original thought, who applied the negative unit in a way which I little anticipated, when I first introduced its square into the theory of incongruous solutions. In the course of a conversation which I had with the skilful investigator in question (Mr. Harley, now of Brighouse) in June last, he informed me that even his mode of using the squared negative unit failed when applied to a certain surd equation, and that he thought it would be necessary to have recourse to a new symbol. Whether my old j will meet all the exigencies of the theory may be uncertain. But I have thought it worth while to revive it here.

White-cottage, Felixstowe, near Ipswich, Suffolk, August 28, 1858.

THE SAILS OF SHIPS OF WAR.

The following correspondence between Captain Schomberg, R.N., the able emigration officer of Liverpool, and Mr. Cunningham, the inventor of the patent system of reefing which has become so popular, has been handed to us for publication.

"Liverpool, 12th August, 1858.

"Dear Sir,—As naval affairs are undergoing revision, I observe in the various pamphlets put forth that the services of seamen are not so easily obtained, and that it is consequently proposed to increase the number of marines and marine artillery to man our ships. Under these circumstances can we not facilitate and reduce the work of seamen aloft? I have constantly before me at this port ships fitted with your admirable reefing apparatus. Why should it not be made applicable to men-of-war? To small ships I think it could be applied in your present form. To large ships, I should propose, where the leeches of the topsails are long, the new and much improved fitting of double topsails; the lower topsail yard pivots in the cap, and there it remains a close-reefed sail at all times. The upper topsail yards should be fitted with your apparatus and sails. They could have a middle cloth patent bonnet from head to foot, and thus *roll up the sails completely*. To floating batteries and vessels for coast protection, in fitting the double topsails, the topmast should be a pole topmast and topgallant mast in one stick, and have a topgallant sail and royal in one sail, all fitted with the patent bonnet for rolling up entirely. Thus you would save much labour aloft, and be spared the mortification of seeing your seamen come down from aloft in a filthy condition when under steam.

"The fitting of double topsails entails some additional strength to the mastheads I

I would propose to increase the mastheads in length, to set a close reefed topsail; increase in strength the trussel-trees and support them from the caps with screw stays, to bear the extra weight of the standard of the lower topsail yard; score the trussel-trees, and double sling the lower yards on each quarter; fit two sets of jeer blocks of moderate size for lowering the yards; and make the chock between the trussel-trees to ship and unship for shifting topmasts, so that you have your topmast free after it clears the cap; and, if necessary, you could carry a close reefed topsail while shifting your topmast; reduce the breadth of the tops in the forepart; reduce the topmast rigging to four shrouds of a side; increase the backstays to the size of the lower rigging, having two pairs on each side; fit a pair of cap shrouds to support the long mastheads; the lower topsail yards should be reduced, and made for carrying only a close reefed topsail of the stoutest canvas; the upper topsail yards could be reduced for carrying sails of a lighter kind, as there will be no dragging at reef tackles and buntlines.

"The advantages of this fitting would be—

"Firstly. Your sails are all of manageable and moderate size, and can be handled with unequalled smartness.

"Secondly. You can strike everything above your lower masts, and still be ready for making sail with close reefed topsails and courses. This, for towing, anchoring in open roadsteads, is of no small consequence.

"Thirdly. No one can deny much labour will be spared; and still ample work for seamen remains to keep up our national prestige.

"As this application of the patent topsail is novel, I submit my views to you, as the inventor, that you may correct anything I have advanced that is not practicable.

"I beg to remain, dear sir,

"Very faithfully yours,

"Chas. F. Schomberg, Captain R.N.

"Bury, near Gosport, 20th August, 1588.

"Dear Sir,—In return to your letter of the 12th instant, I beg to acquaint you that I do not see any practical objection to the application of my system of reefing to the upper topsails of ships rigged on the 'two topsail,' or 'double topsail yard' principle, and that I consider such an arrangement would possess many advantages.

"The employment of deep topgallant sails fitted with my system has been in use for some time in the mercantile marine, and is approved of.

"With reference to your suggestion regarding the equipment of floating batteries, it has struck me that a further advantage derived from the application of my invention to these vessels in the form proposed by you would be, that, in the event of the steam machinery becoming damaged in action, and it be desirable to withdraw from under fire under canvas, the sails could be set without the exposure of a single man. The topsails and topgallant sheets, haulyards, &c., might be led to the gun-deck, and thus sail could be made without a man showing himself on the upper deck.

"I remain, &c.,

(Signed) "H. D. P. Cunningham."

CENTRIFUGAL PUMPS.

Gentlemen,—At a period of my life when, as is usual with students fresh from the learning of the schools, the bent of the mind is more theoretical than practical, and the self-sufficiency of abstract science has to be humbled and disciplined by a better acquaintance with the realities of things, my attention was directed to the power lost in centrifugal machines by the needless velocity which the subject or the agent, as the case may be, still retained after the work was done; and I was led to adopt the expedient of a concentric whirlpool for utilizing this remanent power, precisely in the manner in which, in your Number for the 21st of August, it is described in Professor Thomson's account of his centrifugal pump, as placed on board "The Scotland Fishery Company's Steamer *Isleman*." Having, however, made a working model and submitted it to the test of dynamometrical experiments, I found that the extreme friction which is the accompaniment of centrifugal force—as much, probably, within the body of water as against the external case—made any theoretical saving of very little avail; and so, getting a glimpse of the practical, I asked myself—Why follow such a round of vagaries merely because it has the look and the prestige of being scientific? Why create an evil for the pleasure of detecting it, and then devise a remedy for the pleasure of finding it useless? If a body of water has to be raised to a higher level, a certain quantity in a given time, what has the velocity of its ascent to do with that? Why waste power in producing what is unnecessary? Why not resort to the common-sense, although common-place expedient, of increasing the capacity of our appliances, and so in this manner gain in time, and not by means of velocity? Surely a certain neat compactness of machinery can scarcely ever be so paramount a consideration as to justify a gratuitous consumption of power; especially if it be considered, that the rotatory kind of pump (if not acting centrifugally) does not necessarily require a velocity

that violates the wise maxims of practical science, although it may not be discordant with the theoretical principles of abstract science. But, then, the more homely contrivances in the spirit and interest of the former would not have that *recherché* air of high learning which distinguishes the latter, and so we allow ourselves to be blinded with excess of light. Let me illustrate: a horse runs away, and breaking through the rails precipitates himself into the area of a dwelling house. A crowd assembles. Dig away the ground, says brute force, and throw down the area-wall. Hold, says an intelligent but magisterial-looking man, run to the nearest engineer for his shears with ropes and pulleys, and so do the job properly. Stay, says another, with a more quiet demeanour, but with a slight significant smile on his face, this carter here with his load of straw is our man, throw down a few bundles and the horse will walk out of himself.

BENJAMIN CHEVERTON.

P.S.—I observe an omission in my last communication (No. 1828, p. 183) which I think does not lie with me. The statement that my mode of strengthening a glass tube enabled it to bear a pressure of 100 atmospheres was not of itself very pertinent to the subject, but will become so when I add, that another portion of the same tube that was not hooped gave way under a pressure of 30 atmospheres, and that the utmost limit of the strengthened tube was never ascertained. B. C.

MR. HERAPATH OF BRISTOL.

MR. WILLIAM HERAPATH, the eminent chemist of Bristol, writes to us as follows :—

Bristol Old Park, Sept. 1, 1858.

GENTLEMEN,—In your report of the gas infringement case, Hills *v.* London Gas Company, you have fallen into the very common error of mistaking my son, Dr. W. B. Herapath, *surgeon*, for me. It was I that was a witness, and I am not a Dr. I mention this because great inconvenience and delay have followed from matters having been so erroneously directed.

I am, Gentlemen, yours, &c.,
WILLIAM HERAPATH.

MUSIC BY ELECTRICITY.—A Hungarian, M. Leon Humar, according to the Brussels *Emancipation*, played recently, at a public concert in the National Theatre, by means of electric wires, on five different pianos at the same time. The battery which worked the wires was in an adjacent room. Our readers will recollect that a correspondent pointed out the feasibility of the arrangement in the *Mechanics' Magazine* for June 5, 1858.

SEWAGE UTILIZATION.

GENTLEMEN,—I will endeavour, as far as I am able, to give you the results of my experiments upon sewage, and the plan which I think most likely to accomplish the object desired in respect thereto. When I tried the ordinary method of filtering through sand, charcoal, gas lime, black earth, fine ashes, and burnt clay, they allowed the water to pass freely, but not clear, until the finer portions of the sewage had, in some measure, choked up the filter, when it passed slowly but clear, which very soon caused the filtering bed to be almost useless; to prevent which, I tried the plan of placing similar materials on a perforated floor, allowing a sufficient space for a portion to precipitate before passing through the filter, but in this I experienced difficulties, such as not being able to clear the sewage; it consequently would, if exposed, become offensive. I afterwards tried decantation, and must confess that it appears to me the most favourable plan, conducted as follows:—Provide large covered tanks, capable of holding one or two hundred thousand gallons, over or near which build a large chimney, to be heated with furnaces similar to those used in coal mines, and to ventilate the street drains—two, three, or more galvanized iron tubes (ornamented) in each street, and communicating with the drains, the tubes to be about 8 or 10 inches in diameter, carried above the range of buildings. On the top of each fix funnel-shaped vanes, so as always to be open to the wind, and thereby allow a down current to pass into the drain, which, by the larger extraction furnace, causes a complete current of air to pass along the drains, and do away with the present openings in the streets. In order to cause the finally divided matter to precipitate more rapidly, and, I may say, more effectually, calcine the rough sweepings, ashes, &c., by the large furnace, or, if not in sufficient quantity, use lime or charcoal; and, for the purpose of having them properly mixed with the sewage, should there be sufficient fall, construct an overshot water wheel to drive a small apparatus to mix the calcined material with the sewage, but, where it will not allow the overshot wheel, connect a lever to be moved by the sewage running in connection with a throttle valve of an engine, thereby regulating the supply to the quantity of sewage discharged. When the tank is filled, a spout is fixed to run the sewage into another tank of suitable dimensions, until the one already filled has had sufficient time to precipitate the whole of the matter suspended. In each tank it will be necessary to fix three, four, or more door open-

ings, shut with blocks of wood faced with sheet-lead, working in grooves at each side, joined by chains, and moved and fixed by a windlass, when the sewage has been allowed to stand for several hours. The top block is moved to allow the water to flow freely from the top until it is on a level with the next; afterwards move the next, and do likewise until you arrive at the precipitate. When not in sufficient quantity for removing, screw down the several blocks and fill as before. When a sufficient quantity has been precipitated in the tank, mix with the best materials you have in the neighbourhood for agricultural purposes, to bring it into a proper consistence for carting.

I am, Gentlemen, yours, &c.,
C. Hart.

York-street, Wakefield,
Sept. 7th, 1858.

THE WAR OFFICE AND WOOLWICH "SECRETS."

Gentlemen,—There is not a more impolitic principle, or one more calculated to keep back scientific improvement in the public departments of the State, than that of keeping the country in the dark touching the real value of Government experiments. On this I speak *as I know*, and, as to the sophistry of the political necessity of secrecy, so far as it concerns other Governments, Her Majesty's advisers know better than to suppose that Woolwich and Dockyard secrets are not known through agents ever on the alert to discover what is good and what is bad, in the shape of scientific experiments, in every branch of the public service; and in No. 1828, page 182, you give a striking instance of our having long known the secrets of Cherbourg, which, as stated in some of the public papers, has been recorded at Woolwich through an officer of that department. If other Governments seek information of this character, through its own members *as it does*, surely England has a right to return the compliment; but my experience tells me, we do more injury to the public services by attempting to conceal that which we cannot, as the *Manchester Examiner* justly observes, than if we were to invite the scientific men of every country to closely inspect every improvement at Woolwich; for have them they will, and adopt them, if worth adopting, without asking permission.

If the First Lord of the Treasury were to command that a statement of all money expended in experiments at Woolwich since the commencement of the war with Russia be made public, and the nature and results of the experiments at the same time, Lord Derby would do more real good for the public service than Lord Palmerston, who was more fond of mystery than the interest of the British Empire, sanctioned. Had the Ex-Premier rightly encouraged improvement as he professed, the merits of the "monster mortars," the American breech-loading guns, and other favoured projects, would have been sufficiently known before they were permitted to be made; for there were those, both in and out of the service, who would have gladly assisted in making up a clear report on the merits of those expensive and futile inventions, to guide him, as he took a personal interest, had his Lordship doubted the correctness of the Woolwich reports, under the cover of which they were made and paid for. I should be guilty of injustice were I inclined to see the public money wasted under the cover of secret experiment.

Good or bad, the country has a right to know the full meaning and results of Woolwich experiments, and true economy commands that it should, without the shadow of reserve, for it is by knowing correctly what is done that we are prepared to improve; but it is high time to abandon the practice of making bad experiments appear good by delay, and the patching up imperfect inventions with the hope of the country not knowing to what extent the money has been misappropriated. Four years since, the head of one important branch of the pubiic service asked me plainly what had better be done with a property which had cost the country not a fraction less than £50,000 above its value, through ignorance and party politics combined, and my advice, not to attempt to make good that which was well known to be too bad to justify the attempt, was acted upon; and I think it right to mention it, as it is so strongly in keeping with the late Woolwich secret experiments, as so called. A desire to improve the ordnance of the country for coast defence has deeply taken root, and should be openly and honourably encouraged, but, although I have, for a great length of time, taken an interest in this demanded improvement, and have known much of what has been done, the old practice of secrecy has of late so far been successful to its advocates, that I was not aware till the 27th ult. of Messrs. Fairbairn, of Manchester, having made a monster gun for the Government, to be placed on the south coast immediately. Doubtless, the making has been in good hands, but nothing of its real value seems to be known; however, I trust we shall have in this experiment in gun making something worthy of being known, and that the War Office will not have to regret the misappropriation of public moneys, as in the several

instances which call so loudly for an open and definite investigation.

I am, Gentlemen, yours, &c.,
OBSERVER.

Sept. 2nd, 1858.

[On inquiry we learn that Mr. Fairbairn has made six experimental guns for the Government, and a considerable number of muzzle-loading mortars. These have all been made of cast iron, but the mixtures of the materials have been varied, and the conditions under which the castings have been performed have also been varied, some of them having taken place under pressure, which had the effect of consolidating the metal, and was found to add greatly to its power of resistance. Some of the 26-pounder guns stood as many as nearly 40 charges, loaded nearly to the muzzle, before they burst. We are obliged to "Observer" for having given us occasion to mention these facts.—EDS. M. M.]

CROSS-CUT STONE.

To the Editors of the Mechanics' Magazine.

GENTLEMEN,—The notice of my last induces me to extend my remarks on the above subject. I mentioned, in a confined space, several applications of transected stones. Metal has been used in many cases where stone might be more properly applied, and in not a small degree in the warming of edifices; for instance, the firestone of Brandon Hills, Bristol, and the formation usually termed the "Farewell" (from being found where coal measures cease), if cut across the grain or bed, would form excellent conduits for hot air. When I first showed a slice of transected stone to a chemist, he exclaimed, "That is a smoke consumer," and such is indeed the case, for the heat evolves through the cellular formation of the stone, leaving the smoke behind to peel off and be consumed. Hitherto, I have only tried, as the nearest at hand and most readily cut, the green sandstone formation from Surrey Hills, and from the angular-shaped surface bread-dough, however soft, will not adhere to the pores, and I have no doubt that bread will be much improved by ovens of this transected stone, which allows the gases to pass away, and leaves a perfect even heat underneath the slices all the time. The curing of cocoa or coffee beans in the tropics is effected at present exclusively by solar heat; if dried on these porous stones, instead of on boards, mildewing and decomposition would be obviated. The component parts of the firestones are sand and iron (say of Dylas Quarry, Glamorganshire), and must be sliced by means of plain circular plates with sand and water. I attribute the difficulty of cleansing flax, hemp, and other fibre-producing plants, to the difficulty of drying or curing the same before scutching. I feel that flax must be made softer before it is spun into thread; then we should see sewing machines able to use linen thread, which they cannot at present from its roughness. Competent men tell us that woollen thread suits woollen cloth, cotton for cotton, and linen for linen.

My former letter may call for the attention of sugar makers; and, if you desire, my next shall have statements relative to results of this simple idea.

I am, Gentlemen, yours, &c.,
C. MCKENZIE DICK.

12, Margaret-street, Cavendish-square.

[We can only here repeat our former remark.—EDS. M. M.]

A SIMPLE BREAKWATER.

GENTLEMEN,—I think that both piers and shores might be defended from the action of the sea in the following manner: —I would propose that a series of iron or, what would perhaps be better, timber doors or frames should be suspended before piers or cliffs by hinges, or in any other convenient way. These would completely break the violence of the water in a manner which no stationary rampart can imitate, inasmuch as they would give place to, while resisting, heavy waves. The principle of this as exemplified in attempting to send a bullet through a blanket is well known, and needs no further remark. If adopted for flat or rocky shores it would, I think, be less expensive than any other method of protection. Such contrivances are of course only required on rocky shores where the rocks are of a soft description, as chalk; and in such cases the frames might be fixed close to the rock, which should, to use a technical expression, be "let in," to allow the swinging of the frames. If used upon flat shores they might be fixed on any convenient situation.

J. ALEX. DAVIES.

September 7, 1858.

CHROMO-PHOTOGRAPHY.—(Communicated.)—An invention which is destined, no doubt, to create a revolution in the art of photography has recently been made by Mr. Backshell, of the Photographic Institution, Durham-place, Dalston, and which has received the protection of Her Majesty's royal letters patent. It consists in producing, what has hitherto been considered impossible, a beautifully-coloured non-inverted photograph, equal in brilliancy of colour and superior in detail to the most exquisite miniature extant. We understand that the studio of Mr. Backshell has been honoured by the visits of several of the nobility and gentry, who have testified their appreciation of the invention by numerous orders. Licenses for the practice of the invention are being granted throughout the kingdom.

BULL'S EYE EXPLOSIVE SIGNAL.

Gentlemen, — A self-acting signal to show when the bull's eye in a target is struck by a rifleman at a long range is a desideratum. I effect it in this manner:—A plate of iron nine inches in diameter, whether square or circular, and about a quarter of an inch thick, is punched in five points, one in the centre, and four at the corners; five lucifer matches are inserted in the holes and the stems cut close to the plate with nippers, the frictional ends of the matches resting on the burred side of the plate. This plate is then placed in a bag of canvas or paper, and about two or three ounces of blasting powder poured in with it. The signal thus prepared is hung on the target covering the bull's eye; on a shot striking the plate, the powder is ignited by the sudden pressure of the lucifers between the plate and the iron target. I have left a specimen at the rifle practice ground at Kilburn, and explained to the members of the Victoria Rifle Regiment, who, being all thoroughly acquainted with rifle practice, are much pleased with the signal.

Rosherville, Sept. 11th. J. Norton.

P.S.—Or a more expeditious way is to insert one or two of my glass tube igniters behind an iron plate, which then does not require to be perforated, as the tube is crushed by the stroke of the shot on the iron plate.—J. N.

BOOTS AND SHOES.

Gentlemen,—I would feel very much obliged if through your pages I could be informed whether there be any method of cementing or fastening vulcanized india rubber to the heels and soles of boots and shoes. I need scarcely say that it would be a great desideratum to have an elastic sole to one's boots, independent of india rubber being impervious to wet and its durability. Thomas Langan.

Prienstown House, Aug. 26, 1858.

Proposed Floating Docks in Connection with the North Kent Railway.—It is stated, upon good authority, that the extensive ship-building establishment of Mr. W. Pitcher, situate at Northfleet, and which has been closed for some months, is to be at once appropriated for the construction of some of the largest floating docks in England, together with wharves and quays of great magnitude, and which will extend to the cliffs and be connected by means of a tunnel with the North Kent Railway. Sir Charles Fox, the eminent engineer, has been in the neighbourhood some days, making the necessary survey, and it is hinted that the proposed works, when the plan has been fully developed, will be undertaken as a Government establishment.—*South London Journal.* [We are able to confirm the principal facts above mentioned. The extensive chalk excavations already existing around Pitcher's yard will greatly reduce the expense of constructing the docks, and for this reason the speculation is supposed to be a very promising one.—Eds. M. M.]

IMPROVED PROJECTILES.

Gentlemen,—With every desire to see that neglected and, I may add, injured officer, Captain Norton, more favourably treated by the War Department than he has yet had the good fortune to experience, I beg to assure that gentleman through the medium of the *Mechanics' Magazine*, to whose pages he has contributed so largely, that in the year 1854 I called the attention of the Select Committee at Woolwich to projectiles having the precise object of that described in your Number 1831, page 251; and I also beg to observe, that through Lord Panmure, this time twelvemonth, the Small Arms Committee at Enfield Lock had the subject brought under its notice, when I solicited to have "*brown Bess*" tried against the favourite Enfield rifle, which was refused by a report made to his Lordship, and now in my keeping. I am fully aware of the importance of improving projectiles, and I shall be glad to find the indefatigable officer more favourably attended to than I was by those who should be ever ready to improve the public service by encouraging appropriate experiment.

I am, Gentlemen, yours, &c.,

John Poad Drake.

London, Sept. 11, 1858.

[Identity of *object* is not necessarily associated with identity of *invention.* Does our correspondent intend to imply that his projectile was of the same kind, and made in the same manner, as Captain Norton's? —Eds. M. M.]

COUPLING CHAINS.

Gentlemen,—It is well known how severely coupling chains suffer from the sudden jerks to which they are often subject, and, seeing that this directly concerns the interests of the railway authorities on whose lines the practice is allowed to exist, it is a wonder that some remedy for the defect has not been applied. It is obvious that the ordinary screw-coupling is all that is wanted; nevertheless, in the absence of this, the following plan would be useful. Let every coupling-chain communicate with a spring, which would break the force of the jerk, and thus save the links. As it is, it is a wonder that they do not snap more often.

J. Alex. Davies.

September 7, 1858.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

White, W., and J. Parlby. *Improvements in the preparation or treatment of carton pierre, papier maché, and such like plastic substances, and in the application of such matters to walls, ceilings, and other internal parts of buildings, berths, and other parts of ships and other vessels, carriages, and other structures.* Dated Feb. 6, 1858. (No. 224.)

This consists in producing direct from moulds forms of such materials in colours. For this purpose, having given the desired colours to the material to be employed, the patentees first place the portions of such colours in the desired parts of the mould, and, having pressed them therein, apply to them the general surface of that which is to constitute the general ground. The moulds are previously coated with a mixture of a greasy nature, to prevent the material adhering thereto. The improvements relate also to the treatment of such carton pierre, papier mâché, &c., to produce inlaying or imitation of inlays. For this purpose the moulds are formed to produce recesses in the surface of the material where the inlays are to be obtained, and into the recesses thus formed they introduce others of the material referred to, having the colour desired. In using plaster as a coating inconvenience is occasioned, from the long time required before it becomes sufficiently dry for painting. And the object of one part of these improvements is to substitute for such damp plaster dry blocks or sheets of the composition referred to, strengthened with paper or other fibre, if desired, being previously moulded into the forms desired with the surface thereof decorated in relief.

Ball, W. *Improvements in the construction of ploughs.* Dated Feb. 6, 1858. (No. 225.)

The object here is to improve the construction of that kind of plough which has the nose (that carries the share) cast in one with the plough frame, and thereby to facilitate its progress through the ground, and also to prevent the choking at the throat. The patentee lengthens the neck of the plough, and, at the same time, elongates of necessity the breast or mould board. He also modifies other parts.

Miller, J. *Improvements in machinery for the manufacture of bread.* (A communication.) Dated Feb. 6, 1858. (No. 226.)

This consists in the use of a machine provided with travelling cloths or aprons; on one of these the dough is placed, and passes between rollers placed at such a distance asunder as to form the depth of the loaf, and in this state the dough passes on to the second travelling cloth, when it is operated upon by a cutting tool, which cuts out the loaf.

Mathieu, F. *Improvements in stereoscopes.* Dated Feb. 8, 1858. (No. 228.)

The lenses are fixed in a short box with openings at the back. A piece of wood is hinged to the back, and another piece is hinged to the first piece, and carries the picture holder. These pieces fold up on the box.

Tripe, J. D. *Improvements in apparatus for securing window sashes or casements.* (Partly a communication.) Dated Feb. 8, 1858. (No. 229.)

The patentee uses a detent or lever, which, when in position on one sash, impinges on a rack on the adjoining one, and thus prevents either from being opened until the detent is lifted out. The apparatus is modified, and cannot be fully described without engravings.

Mereoux, P. S. *Improvements in fire-bars and grates for furnaces or other fire places.* Dated Feb. 8, 1858. (No. 230.)

The patentee claims the construction of fire-bars or grates provided at the under side with projecting cheeks or blades for suitably heating the feed air before the same arrives at the fuel on the bars or grates.

Dench, E. *An improved boiler for heating water for heating and warming.* Dated Feb. 8, 1858. (No. 232.)

This boiler has two hollow sides which form water spaces, and between which numerous tubes are fixed, and again other tubes at the bottom, through which tubes the water circulates. Above, and at right angles to the last-named tubes, are fixed the bars upon which the fire is to rest. After passing between the upper set of cross tubes, the flame passes over the water spaces, and descending, heats the outside of the water spaces. A forked flue leads from the sides of the water spaces into a chimney at the back of the boiler.

Johnson, R. W., and W. Stableford. *Improvements connected with the brake levers of railway waggons.* Dated Feb. 8, 1858. (No. 233.)

This consists in connecting by a bolt, hinge, or pin, to the back part of the lever, a bar cut with rack teeth on either edge, and made to pass through a guide on the sole or side rail of the waggon, and in fitting a paul in a convenient position for taking into the teeth on the bar. The bar may be a segment, which, working through the guide, balances the brake lever in position, and prevents its jumping off its seat. Or the bar may be straight, and work in a groove in the body of the waggon.

Newton, W. E. *Improved machinery or apparatus for breaking stones, minerals, and other analogous substances.* (A communication.) Dated Feb. 8, 1858. (No. 234.)

The patentee claims, 1. The arrangement of machines for the breaking of stones, &c., by having a hammer fixed to a revolving shaft connected to a spring, by the action of which the hammer is lifted up immediately after having struck the stones which are introduced in a suitable mortar, whereas the hammer is at suitable intervals thrown down on the material by a cam or tappet fixed to an arbor, receiving motion from a main arbor driven by a prime mover.

Ball, H. *Improvements in repeating and other fire-arms, a portion of which improvements may be applied to ordnance.* Dated Feb. 8, 1858. (No. 235.)

This cannot be described without engravings.

Reader, E., and J. Dewick. *Improvements in lace machinery for the manufacture of velvet lace and looped fabrics, and in the fabrics manufactured by such machinery.* Dated Feb. 8, 1858. (No. 236.)

The ground work where it is uncovered by the loops or pile according to this invention, and as made by the patentees' improved machinery, is an open lace pattern, in which the warp and loop or pile threads are collected and bound together at intervals by the weft according to the size of the mesh required. Their apparatus also forms an open or net work fabric, in which the looping may be purled all round the mesh, or opening throughout the fabric, or in parts only as required. They employ guide bars for the warp threads and for the loop threads, arranged and controlled in a particular manner, in combination with stump bars. There are modifications which cannot be described without engravings.

Askew, C., and D. Ritchie. *Improvements in roasting machine for meat, poultry, or game of any kind, to be worked by spring-jack movements or by the ordinary smoke jack.* Dated Feb. 9, 1858. (No. 237.)

This refers to a mode of arranging several mechanical movements so that they shall be employed as a spit or spits both horizontally and vertically in a screen oven, and which movements are geared in and over the same with shafts, bevel pinion, and other toothed wheels, operated upon with endless chains, by jack movements or other power, and are so that two or more of the roasting machines can work side by side, or on the top of the other. This cannot be described without engravings.

Wells, J. *Improvements in watch cases.* Dated Feb. 9, 1858. (No. 238.)

This consists in a construction whereby the open-faced watch can be readily converted into a hunting watch, and *vice versa*.

BROWN, W., and C. N. MAY. *Improvements in sluice valves.* Dated Feb. 9, 1858. (No. 239.)

This consists in an arrangement of working parts which may be readily removed for repair without disconnecting the valve case from the pipes. The valves occupy a very limited space compared with the passage which is opened and closed thereby. They cannot be described without engravings.

MILLARD, R. *A portable chair.* Dated Feb. 9, 1858. (No. 240.)

This consists of a portable chair with a movable back. The frame is of metal, with the back hinged to the seat, so that it can be set to any inclination, and retained by a catch. By lowering the back level, and the addition of a foot rest, the whole is formed into a couch.

LEIGH, E. *Certain improvements in carding engines for carding cotton and other fibrous materials.* Dated Feb. 9, 1858. (No. 242.)

This relates to patents dated 26th March, 1850, and 16th Oct., 1852, and consists in improving the "flats" or top cards, and apparatus connected therewith, for ensuring their perfect grinding without removing them from the machine.

WELLS, B. B. *Improvements in apparatus for counting and indicating numbers.* Dated Feb. 9, 1858. (No. 244.)

This consists in marking numbers from 1 to 10 around the peripheries of wheels, and in mounting the wheels thus marked upon an axis, or upon axes, in combination or not with a hand or pointer, as may be required.

CARTE, R. *Improvements in clarinets.* Dated Feb. 9, 1858. (No. 245.)

The object here is to facilitate the fingering of certain notes (G natural, G sharp or A flat, A natural) on this instrument in combination with other notes. The last improvement consists in the use of an open instead of a closed key worked by the thumb of the left hand used to produce the higher register, so that the action is reversed, the key being pressed down for closing the hole producing the lower register, and by removing the thumb from off the key to open it for the upper register, by which facilities of execution are obtained in certain combinations of notes.

STEVENS, E. *Improvements in machinery for preparing dough, paste, and like articles.* Dated Feb. 9, 1858. (No. 246.)

Through the bottom of a mixing chamber is an opening for the dough, there being a slide by which a portion can be cut off, and the passage of the dough stopped. Below the bottom is a hollow space for receiving warm water. In the vessel is a stirrer, which consists of a cranked axis, carrying blades bent spirally.

RICHARDSON, G. and W. *The construction of three-wheeled carriages, and omnibuses so constructed to be called first-class omnibuses.* Dated Feb. 10, 1858. (No. 247.)

This consists in putting three wheels to carriages—two in front as usual in carriages with four wheels, and one on the hinder part, near the centre. It also consists in a method of fitting spokes and springs, which requires engravings to illustrate it.

AYTOUN, R. *Improvements in safety cages or apparatus for mines.* Dated Feb. 10, 1858. (No. 250.)

Here the winding rope is connected by a hook to a double chain connected diagonally to the cage by spring clipping levers. The opposite longer arms of the jamming levers are formed with lateral projections embracing the main vertical guides of the shaft. So long as the winding rope is in order, its horizontal action, induced by the weight of the cage, retains the jamming levers horizontal, clearing them from their hold upon the shaft guides. When, however, the winding rope fails, the spring brings those levers into the position for jamming upon the guides, thus holding the cage from falling.

CHATTERTON, J. *An improvement in electric telegraph wires and in insulating telegraph wires.* Dated Feb. 10, 1858. (No. 252.)

This is described at p. 272 of this Number.

CHAMBERS, A., and W. H. CHAMPION. *Improvements in railway breaks.* Dated Feb. 11, 1858. (No. 254.)

1. Connecting rods communicate at one end with a lever fixed upon a transverse brake shaft, and at the opposite ends to levers having their fulcra at the junction of radius bars attached to the ends of adjoining carriages, to allow for the collapse of the train. Otherwise the rods communicate with each other by cords passing over pulleys attached to radial links between the carriages, as in a former patent, dated 10th Feb., 1857. The communication between the brakes of several carriages is so formed by cords or rods as to cause the power applied to bring them into action to be distributed equally among the various brakes.

CASS, L. *Improvements in steam engines and steam-engine boilers, and in apparatus connected therewith.* (A communication.) Dated Feb. 11, 1858. (No. 255.)

One improvement consists in extending at one or both ends the centre by which the connecting rod is attached to the beam, and in fixing to the extended centre another connecting rod, for working a piston, the cylinder of which is fixed below the crank shaft; or he connects the last-named connecting rod to any part of the connecting rod originally attached to the beam; or he extends the beam past the connecting rod, and attaches the second rod thereto. The invention also comprises several modified arrangements for combining engines. The next improvement is to place the condenser and foot valve above the delivery valve of the air pump. To prevent accidents arising from the water getting too low in the boilers, the patentee uses an improved valve. The next improvement is a valve for reducing the pressure of steam. The next is to place a series of pipes or chambers in any part of the flues or of the chimney. The atmosphere enters these pipes at the coldest part, and is conducted through to the ash-pit, where it enters the furnace hotter than when it entered the pipes. He also attaches to the furnaces of boilers a bridge, which contains a series of tubes, and is moveable on an axis, so that the opening from the furnace to the flue may be increased or diminished by a rod and lever attached thereto. The bottom of the bridge communicates with a valve fixed in the ash-pit, so that air may be supplied as required. For the better admission of air he uses grate bars of a tubular form, with their external surfaces grooved. He also perforates the bars, that a greater amount of air may enter. He also constructs fire bars with grooves on their sides. Where it is not convenient to attach a second cylinder to existing engines, owing to there not being sufficient space to admit of a circular cylinder, he uses cylinders the external form of which is a parallelogram. The invention also comprises certain modifications of dead plates, fire doors, dampers, piston rings, &c., and a method of supporting the boiler so as to prevent its corrosion by the brickwork on which it frequently rests.

BELL, R. *An improvement in stable pans, sinks, and urinals.* Dated Feb. 11, 1858. (No. 256.)

This consists in forming in the bottom of the pan, sink, or urinal, a concave vessel with a division descending into it, leaving space below it for the passage of liquid. When there is any liquid in the vessel a perfectly sealed joint is formed.

BARRETT, G. A., W. EXALL, and C. J. ANDREWES. *An improvement in the manufacture of perforated beaters for thrashing machines.* Dated Feb. 11, 1858. (No. 257.)

This invention was described at p. 230, No. 1830.

LOOKER, B, jun. *Improvements in sockets for*

receiving telegraphic and other posts or uprights. Dated Feb. 11, 1858. (No. 258.)

The sockets are of earthenware, the exterior being glazed, and the interior glazed or not. Each socket has a foot, and the bottom is closed to prevent moisture passing up into the socket. The side may be strengthened with ribs.

JOHNSON, C. and G. *Improved machinery or apparatus for performing different operations required in agriculture.* Dated Feb. 11, 1858. (No. 259.)

The apparatus here patented is locomotive, and comprises an engine, propeller and carrier frames, machinery and implements for reaping or mowing, thrashing, and dressing, ploughing, drilling, and harrowing. The specification and drawings must be consulted for the details.

BURTON, G. W. *An improved method of manufacturing white lead.* (A communication.) Dated Feb. 11, 1858. (No. 260.)

This consists in subjecting the lead to the action of steam and atmospheric air, then to the vapour of acetic acid to form the subacetate, and afterwards to carbonic acid alternately and successively, until the operation is complete.

CLIFTON, J. *A new article of nursery furniture or gymnastic exercising chair and support for children.* Dated Feb. 12, 1858. (No. 268.)

This invention was described and illustrated at p. 300, No. 1807, vol. 68.

NEVILLE, T., and W. S. DORSETT. *Improvements in steam boilers or steam generators, and in steam engines.* Dated Feb. 12, 1858. (No. 269.)

The patentees claim, 1. A steam boiler in which water is first heated to a boiling or nearly boiling heat, and then subjected in a divided state into a highly heated vessel and thus converted into steam. 2. Applying to steam engines a fly-wheel working in a horizontal plane.

NEWTON, A. V. *An improved construction of sewing machine.* (A communication.) Dated Feb. 12, 1858. (No. 271.)

This consists, 1. In combining with the frame a crank shaft for operating the needle bar, to form the loop stitch by the rotation of the crank shaft, and without the intervention of other parts. 2. In the use of an oscillating guide way, in combination with the needle bar and crank shaft, for guiding and sustaining the upward motion of the needle, and regulating the length of stitch or feed motion. 3. In the use of a stitch-regulator plate having a graduated curved opening in it with the oscillating guide way secured upon its face by a pin. 4. In the use of an elastic presser for holding down the cloth, having upon its upper surface a thread carrier or eyelet put upon the edge of the slot through which the needle operates, and in front a small projection for closing the barbed point of the needle while moving down with the thread to form the stitch.

NEWTON, A. V. *Improved machinery for stitching or working button-holes.* (A communication.) Dated Feb. 12, 1858. (No. 272.)

The patentee claims, 1. The combination of two pincers for operating the needle in combination with a hook for forming the loop. 2. Certain mechanism for giving to the cloth a lateral movement that the needle may descend through the cloth and then rise through the slit. 3. Certain mechanism for imparting to the cloth a curvilinear movement that gives the eyelet form to the end of the button-hole.

MACINTOSH, J. *An improvement in treating articles of gutta percha made or formed in dies or moulds, also certain articles of gutta percha made by expressing through dies, and also articles of gutta percha made by pressing rollers.* Dated Feb. 12, 1858. (No. 274.)

The article to be treated is plunged into a bath of sulphuric acid for a few seconds or even minutes; it is then removed and immersed in cold water, in which it is well washed.

RYFFEL, J. E. *Improvement of stoves for the purpose of warming rooms and baking bread, called the "hygeian stove."* Dated Feb. 13, 1858. (No. 276.)

This cannot be described without engravings.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

WARAKSINE, T. *Sorting corn by its weight by means of a special machine, called Specific Corn-sorting Machine.* Dated Feb. 6, 1858. (No. 221.)

The apparatus is composed of a drum containing five wings, put in motion by a handle, and which acts upon a spring wheel. In front of the drum is a chest, the interior mantle of which is formed by a plank in which the grain is placed. By raising this plank by a screw, the opening of the orifice can be regulated by which the grain escapes. That the grain may fall regularly, a sort of rake, with iron teeth, is placed in the interior of the chest, spreading across a stop plank, and upheld by a plane board. The rake receives a regular motion by a lever. On falling from the orifice the grain encounters a current of air produced by the wings of the drum, and is divided into three sorts by the moveable plane boards.

WILSON, R. *Improvements in propelling navigable vessels.* Dated Feb. 8, 1858. (No. 227.)

It is proposed to apply on each side of the vessel a screw, or other propeller, supported in a framework, that can be moved up and down the vessel's sides.

CUNNINGHAM, R. *Improvements in or connected with the production of letter-press printing surfaces and surfaces used in reproducing ornamental patterns or devices by printing or otherwise.* Dated Feb. 8, 1858. (No. 231.)

These improvements, as carried out under some of their modifications, are especially applicable to apparatus for composing and distributing types used in letter-press printing. But it is not possible to describe the invention intelligibly without engravings.

PRINGLE, G. *Improvements in machinery or apparatus for propelling ships or vessels.* Dated Feb. 9, 1858. (No. 241.)

Under one modification this consists in arranging the float boards of paddle-wheels upon their arms at an acute angle therewith, the apex of this angle being in the direction of the ship's motion. A paddle, with its float boards arranged in this angular manner, will resemble a hoe entering the ground, in which implement the blade is placed at an acute angle to the handle. The inventor applies to oars a supplementary propelling surface at the extremity of the blade.

TAYLOR, J. *An improvement in the construction of horse-hoes, applicable also to drills.* Dated Feb. 9, 1858. (No. 243.)

The inventor mounts the hoes on independent levers, jointed to the forward end of a balance frame. This frame is capable of sliding laterally on the axle. The two movements are communicated to the frame by a steering rod which passes from the front to the rear of this frame, and has on its forward end a segment rack which gears into a rack on the axle of the running wheels; the outer end of the rod is fitted with a hand wheel or handles.

PING, G. J. *Improvements in machinery for the manufacture of bobbin net and netted fabrics.* Dated Feb. 10, 1858. (No. 249.)

This consists in certain new cuts of wheels (which cannot be described without engravings) whereby bobbin net can be produced with eight motions in lieu of twelve as heretofore, and Brussels, or "three twist" fabrics, with sixteen in lieu of twenty.

PALMER, W. *Improvements in lamps.* Dated Feb. 10, 1858. (No. 251.)

This relates to lamps supplied with fluid by

capillary action, and consists in the use of two reservoirs—a small one immediately under the flame, and the other at any distance underneath. The upper reservoir is on a tube, which descends, and is attached to a piston in the main reservoir, so that, by pressing down this tubular stem, the liquid may be raised into the smaller reservoir, which has an overflow returning to the main reservoir.

NASMYTH, J. *Improvements in the mode of obtaining motive power and of applying it.* Dated Feb. 10, 1858. (No. 253.)

In a moveable vessel the inventor places a piston, and closes the aperture behind it by a plate. He introduces between the piston and the plate steam, compressed air, or any fluid. A rod from the piston comes in contact with an arm from a vertical shaft moving on a pivot, and the vessel is made to rotate, or to move forward horizontally, by a rod issuing from the vessel, by which motive power is obtained. Or he places a piston with its rod in an exhausted vessel; the rod passes through the bottom, and, by the pressure of the air on the piston, motive power is obtained.

ATKINSON, J. R. W. *An improved mode of tightening up and unscrewing binding nuts and screws.* Dated Feb. 11, 1858. (No. 261.)

The nuts of flax holders are now screwed on and off by hand. The inventor proposes to lay the holder up sideways on a plate. Working within this plate are two revolving sockets into which the nuts of the holder enter. These sockets are drawn by friction surfaces, and, consequently, when the nuts have been screwed tight the sockets discontinue their motion.

KEATINGE, W. *Improvements in correcting variations in the mariner's compass from local attraction.* Dated Feb. 11, 1858. (No. 262.)

This consists in the application of a square plate and certain weighted wires to the ordinary marine compass, to retain it directed to the true nortn.

THORRINGTON, G. *A novel method of propulsion applicable to agricultural purposes.* Dated Feb. 11, 1858. (No. 263.)

This consists in the use of a right and a left handed screw revolving in opposite directions, in bearings borne on wheels. The blades of the screws take in the soil, and so effect progression. The screws are driven by power.

WILSON, W. N. *Improvements in machines for cleaning and polishing knives.* (A communication.) Dated Feb. 12, 1858. (No. 264.)

A cast-iron frame contains a trough for the polishing powder, and is secured to a table, or other place, by a set screw; two revolving scour rollers formed of woollen discs are forced together over each other, one in and the other over the trough. These rollers are driven by cog-gearing. India-rubber springs give a yielding pressure, accommodating the rollers to the various thicknesses of knives. On the upper part of these springs are set screws to compensate for wear.

WILSON, W. N. *Improvements in washing and wringing machines.* Dated Feb. 12, 1858. (No. 265.)

This cannot be described without engravings.

FISHER, J. C., and J. BOOTH. *An improved mode or method of driving mule spindles.* Dated Feb. 12, 1858. (No. 266.)

The inventors pass the driving band over single and doubled grooved pulleys, by which they find that the spindles run much more smoothly and with less friction than on the present plan, and, consequently, a saving in power is effected. The invention cannot be described without engravings.

HORSEY, J. *An improvement in india-rubber and other elastic band or ring fastenings.* Dated Feb. 12, 1858. (No. 267.)

In band or ring fastenings, the rings or bands are made with tabs or split rings of metal. The tab is buttoned or screwed to the article. Modifications are included.

NEVILLE, T., and W. S. DORSETT. *A new or improved method of constructing and actuating horizontal water wheels.* Dated Feb. 12, 1858. (No. 270.)

A wheel is furnished with vanes situated radially on its periphery. A pipe of an annular form surrounds the wheel, and through it the water is conveyed to a series of small pipes, by which it is delivered upon the vanes, very nearly in the direction of tangents to the wheel.

SCHAEFFER, W. C. T. *Improvements in obtaining fatty and oily matters from wash waters, or waters containing soap.* Dated Feb. 12, 1858. (No. 273.)

This consists in separating fatty materials from wash waters by adding a solution of chloride of calcium obtained in the manufacture of magnesia and its salts, and which by acting with hydrochloric acid on magnesian limestone, so as to dissolve the lime and leave the magnesia in a separate state.

DUNCAN, J. *Improvements in the manufacture of ornamental chenille fabrics.* Dated Feb. 13, 1858. (No. 275.)

This relates to the manufacture of chenille fabrics so as to bring out the effect of goods embroidered or worked by the hand in relief.

MCDERMID, J. and J. *An improved apparatus or contrivance for supplying water to buildings and dwelling houses for sanitary purposes and for the extinction of fire.* Dated Feb. 15, 1858. (No. 280.)

The inventors retain rain water upon the tops of buildings in cisterns, so as to obtain a supply direct from the clouds, and free from the contamination of the ordinary channels used for conveying it to pumps. To render it more pure, they pass it through filters into a cistern in one of the upper rooms, from which it is led for use by pipes and taps.

BENOIT, P. M. N. *An improvement in counterbalancing the pressure exerted by the steam against the slide valves of steam engines of all kinds.* Dated Feb. 15, 1858. (No. 281.)

The object here is to counterbalance the pressure of the steam exerted upon the slide valves of steam engines by means of springs.

HUNT, E. *Improvements in voltaic batteries, and in means for producing the electric light.* Dated Feb. 15, 1858. (No. 282.)

These relate, 1. To double fluid batteries. The inventor employs a cell of carbon or graphite as the negative element, and which serves as the receptacle for the nitric acid or other fluid. In making them he prefers to take finely divided carbon, and intimately mixes the same with tar, oil, or other hydro-carbon; he then moulds the mixture into a cell, and subjects it to a red heat. By repeated alternate immersion in tar, and exposure to intense heat, any desired amount of density may be given to the cell.

BOUSFIELD, G. T. *Improvements in the preparation of dough, pastry, cake, and other farinaceous articles of food.* (A communication.) Dated Feb. 15, 1858. (No. 283.)

This consists in the use of carbonic acid gas in the manufacture of dough, pastry, cake, &c.

CRAWFORD, M. *An improvement in the manufacture of furnace bars.* Dated Feb. 15, 1858. (No. 286.)

This consists in applying a surface of fire clay burnt like fire bricks next to the fire instead of malleable or cast-iron bars as now in use.

PROVISIONAL PROTECTIONS.

Dated May 10, 1858.

1040. C. F. Vasserot, of Essex-st., Strand. Improved driving machinery applicable either for thrashing, winnowing, cleaning, and bruising

grain, cutting straw, or other agricultural purposes. A communication.

Dated July 19, 1858.

1620. C. F. Vasserot, of Essex-st., Strand. An improved artificial manure. A communication.

Dated August 12, 1858.

1836. G. Metzler, musical instrument maker, of Great Marlborough-st., and J. Waddell, of Brompton. Improvements in the construction and formation of valve musical instruments.

Dated August 13, 1858.

1854. T. G. Pengelly, gun maker, of Walthamcross, Hertford, and H. Brown, gun maker, of Enfield-highway. Improvements in apparatus for straightening gun barrels.

Dated August 14, 1858.

1858. J. Smith, of Seaforth, near Liverpool, and S. A. Chease, of Liverpool, gentlemen. Improved arrangements for obtaining and applying motive power.

1862. G., G. W., and J. Betjemann, all of Upper Ashby-st., desk and dressing-case makers. An improvement in book-slides.

Dated August 21, 1858.

1902. G. J. Walker, of Norton Folgate. Improvements in funeral carriages.

1904. R. A. Brooman, of 166, Fleet-st., Editor of the *Mechanics' Magazine* and patent agent. Improvements in sewing machines. A communication.

1906. C. De Jongh, of Lautenbach, France, manufacturer. Improvements in machinery for combing and heckling fibrous materials.

1908. W. W. Harrison, of Sheffield, manufacturer. An improvement in cruet and liqueur stands.

Dated August 23, 1858.

1910. F. Puls, of Haverstock-hill, chemist. Improvements in the distillation of bituminous matters and gas tar.

1914. A. Boyle, of Birmingham, tool maker. Improvements in the manufacture of certain parts of umbrellas and parasols, and in machinery employed in the said manufacture.

1916. H. D. Jencken, of London, merchant. Improvements in electric telegraphs. Partly a communication.

1918. W. H. Harfield, of Fenchurch-st. Improvements in windlasses.

Dated August 24, 1858.

1920. C. A. Schrader, of Finsbury-sq. An instrument to be used in boring, for mining or other purposes.

1922. J. Hine and A. Abrahams, of St. John-street-road, cabinet makers. Improvements in book slides or holders.

1924. J. Macintosh, of North Bank, Regent's-park. Improvements in insulating telegraphic wires or conductors, and in apparatus employed therein, part of which apparatus is applicable to the manufacture of tubes from india rubber.

Dated August 25, 1858.

1926. H. B. Barlow, of Manchester. Certain improvements in machinery for preparing flax, wool, and other fibrous materials. A communication.

1927. T. Hill, of Heywood, boiler manufacturer. Improvements in machinery or apparatus for punching and shearing metals.

1929. R. A. Brooman, of 166, Fleet-st., patent agent. Improvements in the treatment of vegetable substances in order to convert the fibrous portions thereof into pulp. A communication from Husson-Morel.

Dated August 26, 1858.

1931. J. H. Johnson, of Lincoln's-inn-fields. Improvements in bellows. A communication.

1933. J. Black, of Edinburgh, machine maker. An improved mode or means of obtaining, applying, and transmitting motive power.

1935. S. N. Rodier, of St. Pancras. Improvements in apparatus for regulating gas.

Dated August 27, 1858.

1937. D. Graham-Hope, of Manchester, civil engineer. Improvement of locomotive and other steam engines.

1938. T. Trotman, of Camberwell, pin maker. Improvements in hair pins.

1939. J. Ellisdon, of Liverpool, designer. Improvements applicable to reading chairs and other articles used to sit or recline upon.

1940. F. Matley, of Paris, artist. Certain improvements in apparatus for regulating the flow of gas, and for improving its illuminating power. A communication.

1941. W. S. Clark, of Banbury. Improvements in reefing or furling sails from the deck of vessels. A communication from L. B. Wakeman.

1942. W. Esson, of Cheltenham, engineer. Improvements in wet gas meters.

1943. H. W. Hart, of Fleet-st., gas engineer. Improvements in the application of gas to chandeliers.

1944. F. J. Evans, of Horseferry-road, Westminster, engineer. An improvement applicable to gas purifying.

1945. A. V. Newton, of Chancery-lane. Improved machinery for sorting silk or other thread according to its size or thickness. A communication.

1946. W. E. Newton, of Chancery-lane. Improvements applicable to vessels employed in the manufacture of glass or the melting of vitreous substances. A communication.

1947. W. Kempe, of Leeds. Improvements in apparatus used for winding woollen and other fabrics on rollers, in order to such fabrics being boiled or faced when on the rollers.

1948. J. Fowler, jun., of Cornhill, and R. Burton, of Kingsland-road. Improvements in the construction and arrangement of locomotive and other carriages to facilitate their movement on common roads and other surfaces.

1949. R. Knight, of Foster-lane. Improvements in apparatus for aerating liquids.

Dated August 28, 1858.

1951. G. White, of Dowgate-hill. Ambulatory furniture for apartments. A communication from Von Mannstein.

1953. G. Coode, of Westminster, barrister-at-law. Improvements in the adjustment of hose in machines for distributing liquid manure and other liquids over land, also for an improved method of, and apparatus for, manufacturing the hose to be used with such machines or otherwise, and for gathering and puckering canvas, linen, leather, and other textile and membranous substances.

1955. G. Weedon, of Poland-st., and D. W. Rice, of Woolwich. An improved knife and fork cleaning machine, part of which is applicable to other purposes.

Dated August 30, 1858.

1957. J. Platt and E. Hartley, of Oldham, mechanical engineers. Improvements in certain parts of machinery for preparing and spinning cotton and other fibrous materials.

1959. J. Brazil and J. McKinnell, of Manchester, calico printers. An improved method of indigo blue dyeing. A communication.

1961. J. Brazil and J. McKinnell, of Manchester, calico printers. An improved method of indigo blue dyeing.

1963. J. Oxley, of Camden-town. Improvements in baths.

1965. J. L. Clark, of Adelaide-road, civil engineer, F. Braithwaite, of Bridge-st., Westminster, civil engineer, and G. E. Preece, of Bernard-st., electrician. Improvements in telegraph cables.

1967. L. Wiart, of Cambrai, France, civil engineer. An improved mode of generating steam or heating water or liquids.

1969. J. H. Johnson, of Lincoln's-inn-fields. Improvements in the construction of governors or regulators for steam engines. A communication.

Dated August 31, 1858.

1973. M. A. F. Mennons, of Paris. An improved apparatus for mounting the driving bands of machinery in movement. A communication.

1975. J. Stoneham, of Audenshaw, near Manchester. Improvements in cleaning and treating cotton and woollen waste or other fibrous materials, and in extracting oil or grease therefrom.

1979. W. Rose, of Hales Owen, Worcester, gun barrel maker. An improvement or improvements in piling or combining metals to be used in the manufacture of arms and cutlery, and for other similar purposes.

1981. P. D. Margesson, of Woolwich, captain Royal Artillery. Improvements in treating sugar canes and other canes containing saccharine matter in the preparation of food for animals, also in manufacturing sugar, and worts, or wash, for brewing, distilling, and vinegar making, and in applying the resulting fibre in the manufacture of paper.

Dated September 1, 1858.

1983. W. Phelps, of Red Lion-sq., gentleman. Improvements in wet gas meters. A communication from H. P. Gengembre.

1985. J. Sloper, of Oxford-st., builder. Improved means of and apparatus for indelibly crossing or marking bankers' cheques, drafts, documents, or other things, with a view of preventing erasures or fraudulent dealings therewith.

1987. W. Warne, of Tottenham, india rubber manufacturer. Improvements in the construction of elastic pavements and linings for walls, and in the manufacture of elastic mats, brushes, and pads for packing furniture.

1989. W. E. Newton, of Chancery-lane. Improvements in the construction of locks for doors, safes, and other purposes. A communication.

1991. S. Laing, of Mill Wall, engineer. Improvements in the apparatus employed in the manufacture of gas.

PATENTS APPLIED FOR WITH COMPLETE SPECIFICATIONS.

2022. G. G. Bussey, of Arthur-st., New Oxford-st., manufacturer. Holding and carrying cartridges. Dated 7th Sept., 1858.

2023. W. Tucker, of Rhode Island, United States. An improved variable boring bit. Dated 7th Sept., 1858.

NOTICES OF INTENTION TO PROCEED.

(From the "London Gazette," September 14th, 1858.)

996. C. D. Archibald. "Treating air and gases." A communication.

1000. J. Lawson and T. Robinson. "Dressing flax."

1015. J. Wright. "Printing and dyeing." A communication.

1021. R. Openshaw. "Folding and measuring fabrics."

1029. R. Best. "Illumination."

1043. I. L. Bell. "Iron."

1060. G. H. Creswell. "Inking stamps."

1066. J. A. Clarke. "Coating vessels' bottoms."

1120. W. Clark. "Knotted webs." A communication.

1130. J. C. Brant. "Permanent way."

1131. F. C. Bakewell. "Bolts." A communication.

1150. G. White. "Beverages; culinary purposes." A communication.

1177. J. Luis. "Distilling pipe." A communication.

1187. J. Stuart. "Distilling."

1203. L. Tindall. "Sweeping streets."

1286. R. Wappenstein. "Artificial whalebone."

1287. I. Ketchum. "Perforated baster."

1300. E. T. Hughes. "Sowing grain." A communication.

1329. W. E. Newton. "Supplying boilers." A communication.

1332. G. W. Hart. "Locks."

1441. W. L. Tizard. "Treating malt."

1495. S. Lees and J. Jaques. "Generating steam and economising fuel."

1543. G. Collier. "Drying fibres."

1603. T. Leigh. "Sizing warps."

1632. J. Chadwick. "Printing."

1816. W. Spence. "Purple colouring matter." A communication.

1894. H. Hood. "Railway tyre bars," &c.

1898. W. Clay and E. L. Benson. "Iron and steel."

1906. C. De Jongh. "Combing fibrous materials."

1977. J. H. Johnson. "Preventing boiler explosions." A communication.

1979. W. Rose. "Arms and cutlery."

The full Titles of the Patents in the above List can be ascertained by referring back to their numbers in the Lists of Provisional Protections previously published.

Opposition can be entered to the granting of a Patent to any of the parties in the above List who have given notice of their intention to proceed, within twenty-one days from the date of the Gazette in which the notice appears, by leaving at the Commissioners' office particulars in writing of the objection to the application.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

2032. R. B. Feather.
2047. E. Sharpe.
2057. M. Curtis and J. Wain.
2058. J. C. G. Kennedy.
2063. F. G. Spilsbury and F. W. Emerson.
2071. A. Longbottom.
2092. J. Lewtas.
2111. J. Willis.

LIST OF SEALED PATENTS.

Sealed September 10th, 1858.

449. S. Wheatcroft.
511. S. T. Parmelee.
512. G. Pigott.
517. S. T. Osmond and E. D. Collins.
518. J. C. Martin.
520. R. Edwards.
522. R. A. Brooman.
526. J. Aked and J. Crabtree.
529. A. Wallis and C. Haslam.
531. E. A. L. D'Argy.
532. D. Gallafent.
533. G. Hall.
537. P. Le Capelain.

551. R. Glanville.
568. G. Williams and E. Rowley.
571. D. Evans.
596. A. Lester.
607. E. Coulon.
639. P. H. G. Bérard.
659. J. R. Breckon and R. Dixon.
697. H. Ward.
719. W. Clark.
720. W. S. Clark.
779. W. G. Armstrong.
786. J. Bailey, E. Oldfield, and S. Oddy.
811. J. H. Johnson.
833. E. F. Sans.
835. A. A. Lutéreau.
859. W. Clark.
861. J. Whiteley.
865. G. Finlayson.
929. J. Fraser.
947. A. V. Newton.
951. J. Martin.
963. B. E. Guyot de Brun.
979. W. Hopkinson and J. Dewhurst.
1049. J. Luis.
1061. J. Dyson, E. W Shirt, and H. Shirt.
1315. J. Luis.
1431. C. W. Cahoon.
1458. W. E. Newton.
1503. A. V. Newton.
1545. W. Simons.
1558. W. Northen.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions.

NOTICE TO CORRESPONDENTS.

Articles and Correspondence designed for insertion in the ensuing Numbers of the *Mechanics' Magazine* must reach the Office by the Tuesday of each week, at the latest. It is highly desirable that they should be forwarded earlier if possible.

CONTENTS OF THIS NUMBER.

LONDON: Printed and Published by Richard Archibald Brooman, of 166, Fleet-street, in the City of London. Sold by A. and W. Galignani, Rue Vivienne, Paris; Hodges and Smith, Dublin; W. C. Campbell and Co., Hamburgh.

Mechanics' Magazine.

No. 1838.] SATURDAY, SEPTEMBER 25, 1858. [Price 3d.

Edited by R. A. Brooman and E. J. Reed, 166, Fleet-street, London, E.C.

GRAVELEY'S PATENT APPARATUS FOR DISTILLING SEA WATER.

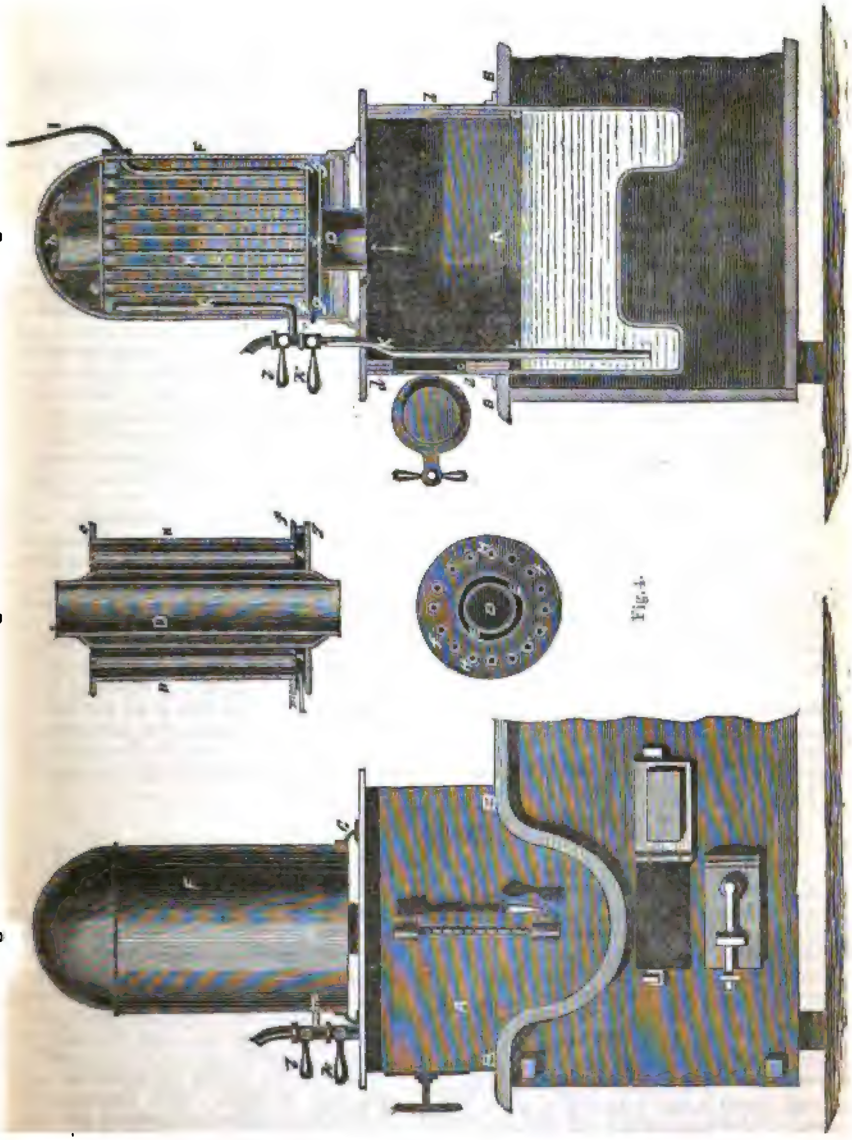


Fig. 2. Fig. 3. Fig. 1.

GRAVELEY'S PATENT APPARATUS FOR DISTILLING SEA WATER.

Mr. W. H. Graveley, of Upper East Smithfield, is introducing extensively into the ships of the merchant navy an improved apparatus for distilling sea water, to supply the ships' companies. The apparatus is divided into two parts, one being a boiler and the other a purifier or condenser, which, for convenience sake, fits over the boiler. He forms the surface of the bottom of the boiler corrugated in order to obtain as extended a heating surface as may be, and cases and packs the sides, or parts of the sides, to prevent loss of heat. In the top of the boiler is an aperture, and a pipe or tube extending to near the top of the condenser fits over or into it. Outside of this pipe he fixes another pipe, and thus forms an air space all round the pipe, which rises up and forms a continuation from the aperture in the boiler. The condenser is made of a dome shape, and is itself divided into two main compartments. Into one the salt or other water to be purified enters, and into the other the steam from the water in the boiler rises and becomes condensed by passing down through pipes fixed in the inner compartment containing the water to be purified. A pipe leads from the water supply chamber in the upper vessel into the boiler, and it and the boiler are fitted with suitable cocks. The steam, after being condensed, passes off through an outlet pipe into a filter, from whence it is to be drawn for use.

In the engravings on the preceding page we have illustrated Mr. Graveley's invention. Fig. 1 is a front elevation of the improved apparatus in a form suitable for use on board ship or elsewhere; fig. 2 is a transverse vertical section; fig. 3 is a separate section of a portion of the condensing apparatus; and fig. 4 is a horizontal section taken through the line *ab* of fig. 3. A is the boiler, which is formed with a hollowed bottom, as shown, and is lined above the hearth, B, with a double lining of felt, *c*, and copper, *d*, to prevent excessive radiation. In the top of the boiler, A, is an aperture, C, into which is bolted or riveted the vertical pipe or cylinder, D, around which is a second pipe or cylinder, E, the two enclosing an air space for rarefied air. Over these pipes is fitted a case, F, of a dome shape, at the upper part. This case is riveted to a rim, G, which is bolted to the top of the boiler. The case, F, is fitted with three horizontal discs or plates, *e*, *f*, *g*, tightly clasping the pipe, D. Vertical tubes, H, H, extend from the disc, *e* (which fits the case, F), to the disc, *f*, in both of which they are permanently fixed, thus providing direct communication between the steam space, *h*, and the chamber, *i*. I is a pipe which supplies salt water to the apparatus from any suitable source. The water, entering by the pipe, I, rises up around the vertical tubes, H, H, until it reaches the top of the pipe, K, down which it descends. This pipe, K, is connected immediately with the feed pipe, L, of the boiler, A; *k* is a feed-cock, which is opened when water is to be admitted to the boiler; and *l* is a waste-cock, from which the salt water may at any moment be drawn off as required. The steam, as it is generated in the boiler, A, rises up through the pipe, D, into the space, *h*; and, descending through the tubes, H, H, falls condensed into the chamber, *i*, from which it may be drawn off by the outlet pipe, *m*, and led to the filter. As the steam is condensed by the water in the tubes, H, H, that water becomes more or less heated; and, consequently, when it is admitted to the boiler, A, is converted into steam with a less expenditure of fuel than would otherwise be required. Cocks for drawing off the salt from the boiler, and other necessary appliances, are provided, but, being well understood by practical men, need no description here. It should be remarked, that the case, F, has a double bottom, enclosing layers of felt, to prevent the heat from the boiler reaching the condensing water.

THE PROGRESS OF WAR.

The time has arrived for the public to consider intently the progress which the art of war is making, and to afford the Government some guidance—for Governments now look to the public for guidance—respecting the future decision of certain questions which affect the advancement of that art. The fact that the Emperor Napoleon is now constructing swift and weighty vessels for the express purpose of sinking at one fell swoop any ship that he may please to assail, no matter how large or how thickly manned she may be, summons us to the earnest consideration of our powers of defence. It may be said without extraordinary national egotism that England has nothing very calamitous to fear from any power on earth, if she be left to develope and apply her own resources in her own defence. But every one acquainted with the private transactions of our modern English administrations is aware that we have grounds for dreading a terrible amount of obstructiveness should the nation be placed in any emergency or peril. Our Governments oppose the introduction of novel and potent systems of warfare for three reasons.

In the first place, they allege that their early applications would be attended by uncertainty. Secondly, they pronounce them, in most instances, inhuman and cruel. Thirdly, they consider their introduction impolitic. To their first objection no one who has watched the progress of practical science in this country for the last half-century would condescend to reply. Indeed, we have done with the fear of uncertainty since the days when Blake ranged his frigates before the stone fortresses of Santa Cruz. We have not, of course, done with prudence; but to give our enemies easy triumphs, for fear of the miscarriage of anything and everything that is new, we shall never consent. Indeed, the allegation, though often used, is a subterfuge rather than a reason. The objection which is based upon the inhumanity and cruelty of wholesale warfare has to be met upon the same ground, and in the same manner, as the objections brought against warfare in all its forms, however mitigated. We cannot therefore discuss it here. But very serious doubts are justly entertained respecting the humanity of the present system of moderated warfare, which is usually very barren of results, of fearful cost to the belligerents, and not unfrequently characterized by that foolish lenience to foes which is of all things most fatal to ourselves and our friends. We have sad examples of all these evils before us in the events of the last few years. We have gained nothing but a feverish peace, which is almost as bad as war itself, by our contest with Russia. Yet that war cost us a sum which we dread to name. And in that war we left our own troops to perish of hunger, cold, and disease, while we spared the Russians as far as ministers at home could spare them. As to the last objection mentioned—the impolicy of introducing new powers of destruction—that seems to us to be wholly and utterly set aside by the building of the Emperor Napoleon's battering rams. What can be more terrible than the sudden crashing and foundering of ship after ship, with crews of hundreds of men on board of each? Such a system of warfare is perfectly novel. It leaves no room for personal skill or courage to display itself. The finest seaman in the world would be as powerless as a crew of the worst of Lord Ellenborough's Kroomen, against such engines of destruction as Napoleon is introducing. We take but little note of the claims of Admiral Sartorius or any other person to the first conception of them. There is nothing remarkable in the idea; it is its adoption only that is singular and surprising. Nor are we disposed to censure that adoption. It has released us, as a nation, from all scruples of conscience in connection with the progress of the art of war hereafter; and, if our rulers are wise, they will henceforth defend these islands by means which, while they will far exceed the present defences in terribleness, will be very much cheaper than they. Let them now loosen the hands of our men of science, and call upon them for economical methods of resisting hostile attacks. They will certainly be forthcoming. Systems of warfare have already been offered to the Government, and refused on one or other of the grounds before mentioned. Mr. Macintosh's system, which was first offered to the Government in 1853, and was again placed before the War Minister during the Russian War, was not only neglected, but absolutely suppressed, by Lord Panmure, aided by the legal authority of the Lord Chancellor, solely on the ground of its undoubted efficacy. The publication of the specification of Mr. Macintosh's patent was interdicted by Lord Panmure, to prevent the Russians using it. Readers will remember how deadly an operation it was to carry our ships in openly before the batteries of Sebastopol, and how eagerly both fog and darkness were looked for, that our steamers might steam in unobserved, and then deliver their broadsides against the Russian works. Yet the Admiralty, confident—far too confident, alas!—in their own resources, forbade the use of Mr. Macintosh's invention, which gave him the power of generating a dense and impenetrable fog before the batteries of the enemy, driving the gunners from the works, and concealing the approach of our ships as long as might be desired. The consequence was our fleet was carried in by Lord Lyons to the batteries, and very soon withdrawn all but ignominiously beaten, and he never again dared place it in the presence of the Russian batteries. The only useful service he ever performed with the magnificent steam fleets of England and France at his disposal was performed by sending steamers in during fogs to deliver their broadsides, and then run back out of range—a practice which the Russians soon came to hold in contempt. How different would the position taken by England have been if the material which was purchased, shipped, and taken to the Black Sea by the enterprise of Mr. Macintosh himself, had been employed, as he proposed, in paralysing the enemy, and placing the sea faces of their vast batteries entirely at our mercy! More lately he has offered it for use against the Sepoys in India, but with no better success. Yet nothing more desirable could be conceived for the purpose of

aiding our gallant men in that country. The invention would have given General Wilson the power of converting the Jumna into a river of fire as the mutineers retreated across it. The same invention would have given our small army the power of scattering fire like hail upon the heads of the rebels. And surely, if ever there was an occasion when we might have turned the power of our science against our enemies, it was the war in India last year, when the common amenities of war were utterly disregarded, and our one object was to compass the destruction of the revolted troops. It is as surely time for the country to inquire how it is that such an invention is not favoured by the guardians of the State. There is nothing secret, nothing illegitimate, nothing suspicious about it; the inventor has published his plans, courted investigation, and even invested much money in furtherance of his invention; there can be nothing absurd or preposterous in his proposals, for Lord Panmure took pains to keep them secret during the war, and thus pronounced even more strongly in their favour than if he had consented to adopt them. We have never yet known a word to proceed from any other official person against them; there is considerable anxiety in the nation respecting our defences; and members of parliament are everywhere threatening to tax us even yet more heavily, in order to increase them. There can, therefore, be no good, no plausible reason even, for delay and indecision and circumlocution in the matter. The public should see that the invention is no longer neglected. They should also see that a better spirit is introduced into our War Department. It will not do for us to plod heedlessly on in this art of war, which we are so well able to improve. Battering rams, however murderous they may be in principle, are not the last and best devices that we shall obtain. It will not be easy to build a ship which shall sustain a thick sheathing of iron, a solid metallic prow, a huge engine, and a weighty armament, and at the same time steam at a very high velocity. Such a ship must be either enormously deep, or enormously broad, or enormously long; and if she be either she will be inefficient. Great depth will render her incapable of entering waters where other ships may sail in safety; great breadth will be scarcely compatible with other necessary qualities; and great length will prevent her being handled with facility. We may, and probably soon shall, build battering rams; but we shall before long supersede them by better contrivances. What we most urgently want is a little breath of enterprise blown into moribund ministers, that the people may be enabled to put forth through them the power of self-defence which we possess so abundantly. We should then no longer have to sigh under our present reputation—a reputation tarnished at Sebastopol, Cronstadt, and, despite all our gallantry, at India likewise.

THE PRESERVATION OF IRON SHIPS.

There is good reason to believe that the great and formidable obstruction to the general use of iron in the building of ships is about to be completely overcome. That obstacle is the rapidity with which iron bottoms become foul in the waters of almost every sea and river in the world, in consequence of which an enormous expense has to be incurred in frequently docking and cleansing ships constructed of that material. Copper cannot, of course, be applied immediately to the iron as it is to the plank of wooden ships, because of the destructive galvanic action which would be instantly set up when the vessel was floated in sea water. Nor are the various varnishes and other compositions which have been invented for the purpose found fully efficient, unless, indeed, it be that which is applied by Mr. Hay, the Admiralty chemist, of Portsmouth, to the bottoms of the iron vessels of the Navy. This has certainly succeeded admirably, and is based upon thoroughly sound scientific principles; its limited use probably arises either from the jealousies of rival inventors or from a want of proper enterprise among iron shipbuilders. Another improvement is, however, now under trial, having been patented by Mr. J. Scott Russell, the eminent shipbuilder of Millwall. His plan is based, we believe, upon the same scientific considerations as Mr. Hay's, although this fact is probably unknown to Mr. Russell himself. According to his (Mr. Russell's) method, the bottom of an iron ship is first coated with varnish or other substance which is non-conductive of electricity, and which may be prepared from resin, gum, bitumen, or other suitable matter. After this, further coatings of such non-conducting matters in combination with copper reduced to powder are applied, and the last coating is burnished. A smooth, polished surface of copper is thus obtained, and is insulated from the iron of the ship. Mr. Russell uses the powder of copper obtained by the process known as the wet way of precipitating pure copper when extracting silver from ores, or he employs copper when precipitated or reduced to powder by other means. We have formed a very high opinion of this invention of Mr. Russell's, and expect to find it attended by excellent results in

practice. At the same time, we are not insensible to the difficulties which will be seen to attend its practical application. In the first place it will be found, as it has heretofore been found, extremely troublesome to secure the requisite dryness in the bottoms of ships that have been afloat. Before the first coating of non-conducting material is applied, the bottom has to be thoroughly dried, or the insulation of the copper cannot be secured. And it is a very difficult thing to get rid of all moisture on so large a surface as the bottom of a ship, and to prevent the trickling down of water between the plates after it has been immersed for several months in sea water, and after more or less water has been from time to time passing in various ways over the interior of the ship. And in the next place the repeated coating of the bottom, the powdered copper, and the burnishing process, will all be found very expensive. This objection, however, while it will reduce the superiority of iron to wood for shipbuilding purposes, will by no means equalize the advantages of the two materials. The cost of timber is so great, and the waste of it in shipbuilding so excessive, that if iron can be preserved at any moderate expense it will inevitably be preferred. We would remind Mr. Russell, that in applying his invention he must be careful so to mix the last coating as to ensure as large a preponderance of copper as possible in the burnished surface. The advantage of a copper surface is, that, as the metal itself wastes, marine vegetable and other formations which tend to foul it fall off with it. But, if the vehicle which he employs to carry the powdered copper should present itself largely at the surface, it will afford a nucleus for the fouling substances, which will cling to it, and thus prevent even the wasted copper itself from falling off. With this point well attended to we shall expect valuable results from Mr. Russell's improvement.

THE LONDON UNITED BUILDING TRADES SOCIETY.—A society bearing the above designation, and consisting of bricklayers, carpenters, masons, plumbers, smiths, plasterers, and painters, has recently been established. This society was originated by working men themselves, with the very laudable object of raising a fund out of which the orphan children of men of their class might be provided for. We cordially wish these spirited workmen success, and would urge their fellows to support them in their honourable enterprise. We would say, with their secretary, "By the united efforts of the Building Trades, an Orphan Asylum may be established and supported, and it would do them infinite honour. Proud and delighted they would feel on possessing such an institution . . . thereby proving to demonstration that they are men who know their *duties* as well as their *rights*, and who are determined to do all that in them lies to make the world the better for their having been in it."

THE ATLANTIC TELEGRAPH.

MR. WHITEHOUSE, the late electrician to the Atlantic Telegraph Company, considers that he has a grievance against the Directors, on account of his services having been dispensed with. It is an unfortunate affair that any bickering should arise at such a critical period, though of very little interest, except so far as the great object in view—the repairing of the present cable, or the successful laying and working of another—is concerned; he has evidently been, to say the least, very imprudent.

Mr. Whitehouse has also taken occasion to pen a long history of the undertaking, which would be very interesting and valuable but for the vanity, jealousy, and animus against his colleagues, who have been more successful than himself, pervading the whole statement, which places him in a very unenviable light in the eyes of all who consider candour and sincerity to be necessary attributes of a really scientific man.

It is clear from the tone of this statement that he wishes to ignore the work and talents of those with whom he co-operated in the projection of the Atlantic line as much as possible, and his narrative of the first establishment of the Company, and the experiments which preceded it, can only be accepted with some deductions from his own share, and from the importance of his labours as chronicled by himself, and some additional prominence to the exertions of others who contributed in reality far more to the inauguration and carrying out of the project.

Mr. Brett, Sir Charles Bright, and Mr. Field, who were co-promoters with him of the original company, are put aside as much as possible, and it appears that everything that was done rightly was done by himself or at his suggestion, while it is equally manifest that he had no part in anything that is open to censure. We are

to believe, for instance, that he thought the experiments which took place at the Magnetic Telegraph office in Old Broad-street, in October, 1856, insufficient, that the results were incontinently published, and that, if he had carried out his own wishes, they would have been repeated again and again before he would have regarded them as a guide in so great an operation. Yet Mr. Whitehouse, in a letter published in the *Athenæum* Oct. 11, 1856, speaks of this experiment as "the most triumphant success," as a "matter of fact proof," and considers it a sufficient test to put an end to all doubt as to the validity of his previous theories, which Professor W. Thompson had doubted; he was also a party as a promoter of the Company to letters written at the time by Professor Morse, and published with the prospectus, which had as their basis the experiment in question.

We should not have felt called upon to offer so severe a comment upon Mr. Whitehouse's manifesto but for the ungenerous and invidious attack, of which he has made it the cloak, upon the engineering department, the dangers and discomforts of which he has avoided, and of which his own narrative shows him to be entirely ignorant. Nothing has been done there according to his taste, although the results of the engineer's work has been that the cable has been laid, and signals stronger than those passed through it when on shore at Keyham received at Valentia from Newfoundland, while he has in his own department met with little success in turning those signals to account.

He criticises the machinery which was made with the advice and co-operation of some of the first engineers of the day, by one of the most celebrated mechanical firms in London, and which has done its work most satisfactorily, according to the testimony of the engineers on board both ships. He is apparently forgetful, or unable to believe, that those eminent men whose lives have been devoted to the study and practice of engineering are more likely to know how a machine should be constructed for a given purpose than himself, who, two years since, was gaining his livelihood as a surgeon in a provincial town, who appears since that time to have disappointed everybody with whom he has been engaged, and finally to have become bitterly disappointed himself.

Another source of cavilling against the engineer of the Company is, that the rough weather made the ship go faster than it otherwise would have been allowed to do, and that this greatly relieved the strain upon the cable, and made it unnecessary to use so much break power as would have otherwise been called for, and hence that some of the credit ascribed to the engineer is not his due, but the result of the good fortune which he encountered in meeting with bad weather. Can there ever have been before so childish an exhibition of petty spite and jealousy as this? It is as little worthy of serious criticism as other parts of the document which are couched in a similar strain; but it is right to recall remembrance to the fact that Sir Charles Bright's calculations as regards speed appear to have been pretty nearly carried out, for in a pamphlet published by the Directors of the Company in July, 1857, before the departure of the expedition of last year, his anticipation of the rate at which it was desirable the paying-out vessels should move is fixed at from four to five miles per hour, and the actual run by the *Agamemnon* this year of 815 miles was made as nearly as possible at the average rate of five miles per hour, the rate of the *Niagara* being very nearly the same.

Mr. Whitehouse also endeavours, in an indirect manner, to disparage the benefits which he gained from becoming associated with one of his partners who had much experience in the construction and working of telegraphs, at a time when his own knowledge was altogether confined to theory; but, in an article which he communicated to the *Engineer* of Jan. 23, 1857, and afterwards reprinted himself, he tells a very different tale. He there says:—"In these experiments I had the advantage of the counsel and co-operation of Mr. Bright, the engineer to the Magnetic Company, whose experience, previously gained on the subterranean system of wires under his care, embracing a mileage more extended than that of any other which the world affords, was, on all points, of the utmost value to me." No doubt it would have been better had he availed himself, at a later period, of such practical advice as telegraphists of longer and more widely extended knowledge could give him. The facts scarcely require any comment. He would have done well to confine his *cacoethes scribendi* to the matter in dispute between himself and the Company, without seeking to make himself a character by detracting from the merits of a work in which he has borne no part.

The report of Mr. Varley, the electrician to the Electric Telegraph Company (who

has recently been consulted by the Atlantic Company, together with Professor Thompson, Mr. Edward Bright, Mr. Henley, and others practically versed in telegraphic matters), places the fault at about 270 statute miles distant in the cable, from which must be deducted 22 per cent. for slack, to give the distance to be run by a steamer in reaching it.

He also states, from the data of testing *prior to the departure of the expedition to lay the cable, that there was then a serious fault in it* (which must have escaped the notice of the late electrician of the Company, in whose department the proper electrical condition and insulation of the conductor was), in addition to the defect above mentioned which has since supervened.

He further condemns the employment of *such intense currents as have been passed into the cable* since its submergence by Mr. Whitehouse's apparatus, which he considers *may not improbably have injured its insulation.*

If these opinions are correct (and we believe that the power of the currents used is held by those who have the greatest experience in the testing and working of telegraphic wires in this country to be sufficient to account for the impaired insulation of the line), it is of the utmost importance that the greatest possible care should be exerted with all future undertakings of the kind to seek for and obtain the best possible advice of a practical kind from the very outset of their operations.

In order that our readers may judge of the facts for themselves, we now add Mr. Whitehouse's communication (omitting some personal vaunting at the commencement, and taking up his narrative at the time when the Company had been organized); and we subjoin to it a further analysis of Mr. Varley's report before alluded to, and also of the rejoinder which the Board of Directors have made to Mr. Whitehouse's statements through their Secretary.

After complaining that the contracts for the cable were given to distant manufacturers, and that therefore the two parts could not be tested together during the manufacture, Mr. Whitehouse proceeds as follows :—

"The testing of the cable during the process of its manufacture presented points of difficulty, and new phenomena of great interest. Knowing the importance of this subject, it was my wish to attain the highest degree of perfection in the insulation, an amount of defect or imperfection which might be of no importance for shorter lines being sufficient to prove absolutely fatal to the project. It became necessary, therefore, to adopt a very high standard, and to make use of a more than usually searching current. Every mile of cable made came in detail under my own personal examination, and was tested in various ways; for which purpose detectors of special delicacy were constructed. The constant examination of lengths in detail in this manner enabled me, as mile by mile could be added at pleasure, to make repeated researches into the best means of detecting a fault at various distances. A known faulty piece could be inserted at any distance, and then in a variety of ways, with different instruments, examined and detected. I have records of a great number of trials of this character in which my assistant inserted the fault at a spot unknown to me, in order to test and verify our calculations. The tact thus derived both by myself and assistant from these repeated experiments has proved to be invaluable, and has already been of the utmost service in the operations of the Company. It has pointed out with confidence the position and nature of an injury immediately upon its occurrence.

"During the manufacture of the cable at Greenwich, the opportunity was afforded of observing the effect of temperature upon the insulation in the most marked manner, the change from night to day, and from sunshine to shade, producing a variation in the state of a portion of our cable to a degree which was at first sight alarming. This effect is transient, and ceases when the temperature falls. It is quite unconnected with the occurrence, at a later period, of serious injury to some miles of our cable by the actual melting of the gutta percha under exposure to the intense heat of the sun. An accurately drawn table, the result of multiplied observations, has been constructed, both as a record for myself and a guide for others who may follow. During the manufacture of the cable, Professor Thompson drew my attention to certain variations in the conducting power of different specimens of copper wire, amounting to 45 or 50 per cent., while no proportionate chemical impurity could be detected. From that time every separate hank of wire was tested by myself or my assistant, and all below a certain standard rejected.

"I turn now to some points in the early progress in the engineer's department. In order to determine the best form of cable, great numbers of specimens were made. These were subjected to the most critical trials for strength and flexibility, and their mechanical fitness was, in this respect, I believe, fairly exhausted. Experiments were continued for several eeks, and the

result led to the adoption of the present cable, no trial having been made of the rate of sinking of the various specimens. The consideration of this vital question was referred by the Board to a sub-committee (of which neither the engineer nor myself formed part), consisting of Mr. Field, Mr. Brett, and Mr. Tupper, and was by them almost immediately decided, upon what appeared to me a very limited and partial examination. A specimen cable of light specific gravity and great strength, made after experiments of my own, was rejected by one of the members of this committee in an almost contemptuous manner. 'I would not have it if it were laid,' said he. Nevertheless, I thought it right in a written report to state my own personal conviction of its superiority, with the reasons for my preferring it to the present form.

"It is to be regretted that an early promise, incautiously made to the shareholders and to the public, of the intended completion of the line within the year, prevented the determining of many of these points by direct experiment. It had been proposed to make trial in deep water of the relative mechanical advantages of several of the best forms of cable, by paying out and raising again considerable lengths of each. Much information of the highest value would thus have been obtained. The unsuccessful expedition of last year, the experimental trip, the early attempt of the present year, and the details of the successful expedition itself, all lead irresistibly to the conclusion that very great expenditure and grievous discouragement would have been avoided if the course above advocated had been at that time adopted by the Company. It is equally clear that our past experience may lead us hereafter to provide a more suitable cable at less cost, requiring a paying-out machinery of a more simple construction, and attended with less hazard in its use.

"It devolved upon the engineer to devise the necessary means for the safe submersion of the cable, and it was decided—unwisely and unfortunately as it appeared to me—to make the same machinery fulfil its office for both the light deep-sea part and the heavy shore-ends of the cable. This almost necessarily ensured its unfitness for one or other of these purposes, as in point of flexibility the cables were the very opposite of each other; their size differed considerably, and their relative weights were as 8 to 1. The engineering part of the enterprise has, however, been so prominently before the public that I need not linger over it.

"It was not until a considerable length of cable had been manufactured at Greenwich that I was enabled to commence trials of a set of experimental instruments made for determining the exact form, size, and structure of induction-coils best suited to our purpose. These trials were resumed from time to time, as the additional length of the cable admitted, in order that I might work out the details of the laws by which I should determine the just proportion which each part should bear to others, and the whole to the length of cable, in order to obtain the best possible results. These determinations, involving a very considerable amount of research, were most necessary and important; but they required time, and more than could well be afforded. Lastly, the actual telegraphic instruments intended for use on the line, when laid, could not be put in hand with any certainty of results till all these preliminary stages had been passed through, and a successful trial made upon at least 1,000 miles of cable. They ought to have been tried upon 2,000.

"Several incidents occurred during the manufacture which caused me the deepest anxiety. I have already alluded to the effect of temperature upon the cable at Greenwich. At Birkenhead the evidence was, if possible, more striking and more embarrassing. The testing of various lengths showed a great depreciation in its condition as compared with the very same lengths previously examined at the gutta-percha works in London. Again, there was a day on which the direct rays of the sun were so intense at Greenwich as to cause the gutta percha in some exposed parts of the cable to soften and actually to exude, showing itself in drops or tears upon the outer surface. Several miles of the cable were thus most seriously injured. The whole of the steel-covered cable prepared for the mid-ocean splice was in this way destroyed. It was on consideration decided not to remake it.

"The time fixed for the departure of the expedition was now so near at hand that it became necessary to complete our instruments without delay. On trying them through 1,200 miles of cable, it was satisfactory to find that there was ample power in the generating apparatus for the whole distance, so far as we could judge from the half-length. But, the instruments being new in form, and differing in every respect from those previously in use, the most experienced manipulators would have everything to learn afresh. If, therefore, the cable had been laid on that occasion we should have had no operators ready to work the instruments.

"The trials made in Cork Harbour for the first time upon the whole length of cable —hurried and imperfect as they were, in-

terrupted, too, at the turn of tide—proved two things: first, that I had provided ample power; secondly, that the receipt of signals was slower than I had expected, and that consequently parts of the apparatus would require considerable modification. I can hardly trust myself to say how deeply I then felt that the interests of the electrical part of the undertaking had been sacrificed to less weighty considerations. The paramount importance of the scientific element in such an enterprise was unrecognised— it remains so to this day. The expedition sailed, and failed. I had expected to be able to make use of our special instruments for speaking during the whole voyage—a mistake as I am free to confess — but one which a previous rehearsal would have immediately made manifest; as it has since proved to be contrary to the very nature of things that our apparatus should do justice to itself in all the varied movements of a vessel in mid-ocean.

"The unshipment and storing of our cable at Keyham for the winter promised at length to afford me the opportunity, so long sought for and so deeply needed, of thoroughly maturing the details and working of our instruments, in order that on the opening of the line I might be ready for the transmission of intelligence without loss of time. It was not till about six weeks after the accident that I was able to get the first official step taken towards this object, and one-fifth of the whole time expired before the work could fairly be begun. In the interim I was able to get a series of very valuable observations made upon the lost length of cable, one end of which was connected with Valentia Island, while the other had been dropped in the Atlantic. Terrestrial currents, variable in force and in direction, were noted as occupying the cable night and day; these have been tabulated and represented in a series of diagrams intended for presentation to the Royal Society.

"The 2,150 miles of cable stored at Keyham became now the subject of continued research. I was anxious early to examine the influence which the coiled state of the cable could exert upon the results of my experiments. The cable represented a gigantic helix, containing 2,150 miles of wire. Repeated experiment showed that every wave of electric force on its entrance into the cable was accompanied, or rather preceded, by a smaller wave of opposite polarity inductively excited in the adjacent helical turns; this small but opposing antecedent wave was traceable throughout the whole extent of the cable, *pari passu* with the greater, and it was demonstrable that it tended, under some circumstances, seriously to embarrass the action of the instruments. I therefore was able to state with confidence, that this source of difficulty would cease upon the laying of the cable, and that, not only on this account, but from other considerations also, I should anticipate a greater ultimate measure of success than we could attain under the existing conditions at Keyham. I referred especially to the low temperature of the ocean depths, calculated largely to benefit the insulation, while at the same time it would augment the transmitting power of the conductor. I then proceeded to test in the most rigid manner the practical working of the instruments. The staff of manipulating clerks was engaged in transmitting despatches, trying and comparing various instruments of my own, various modes of manipulating, and various forms of alphabet; in fact, practically searching for the best in each. Several most important advances in instrumentation and in detail were obtained in this way, and were incorporated with the Company's present system. Other improvements, the results of observations made at a later date, it was not in my power to incorporate, as my request for the additional aid required in the workshop met with a negative response from the Board.

"It was my earnest desire at this time to bring before the scientific world some of the more novel and interesting of those phenomena by which I was daily surrounded, and to invite the presence of those specially interested in such matters, assured that by such intercommunication the real welfare of the Company would have been forwarded, while science would have been able both to give and to receive additional impetus. These wishes becoming known at head-quarters, I received a letter forbidding all scientific communication upon this subject, couched in terms so peremptory and oppressive that I at once felt it necessary to tender my resignation. I was subsequently told that I had entirely misunderstood the purport of this letter, and, being urged to do so, consented to withdraw my resignation, entering at the same time an indignant protest against such attempts at the suppression of thought and intercourse on points of science.

"I obtained shortly afterwards, for several weeks, the kind counsel and aid of Charles Walker, Esq., F.R.S.; conjointly we investigated some matters of high interest, and elicited very important results with reference to the static charge communicated to the wire under various conditions. We also made very accurate measurements of the proportion of electric force manifested at the distant end of the cable, under various circumstances, as compared with the

whole amount of force entering, and the percentage of loss. It had long been my wish to try some means of shortening the usual mode of telegraphic correspondence, and I had thought it possible to attain this end either by the use of the phonetic system or by having recourse to a code arranged on the principle of the Admiralty code, which by a single hoist of several flags can convey an entire sentence. Well aware of the difficulties surrounding this subject, and of its general inapplicability to short lines, I yet thought it worthy of investigation for the special purpose of the Atlantic telegraph, where every moment saved in transmission would be of importance. I had in the previous year bestowed much attention to this subject, and had a large amount of matter in type and manuscript. The whole at that time was set aside by order of the Board. Now, however, upon my renewed application, I was allowed to resume it at my own expense; and Mr. Bartholomew, the superintendent of Valentia station, took the matter most zealously in hand for me, and repeated trials made at that time satisfied me that the foundation then laid admits of being wrought out into a system of great value for all submarine lines of 1,000 miles or more, where the process of signalling is comparatively slow. It will require the bestowal of some months further of thought and labour upon the subject ere it can be laid before the world in a complete form for use.

"Some weeks before the first sailing of the expedition in the present year the chief improvements in instruments—suggested by the experimental practice at Keyham—had been completed and tested repeatedly in every possible way. The final instruments embodying these improvements were put in hand at Henley's, the best manufacturer in London.

"Professor W. Thompson at this time visited Keyham with the object of testing and introducing a new system of telegraphing, about which he was very sanguine, the principle being that the various letters of the alphabet were to be indicated by corresponding degrees of force exerted by the current, and rendered visible upon a small and delicate galvanometer, a single motion sufficing for each letter. A ray of light constituted the index, as is usual in very delicate instruments, and by the movement of this in degrees of deflection the despatch was to be read off. This system, beautiful in theory, seemed to require much to reduce it to a practical form—if, indeed, it should ever be made available. I thought I saw more in it as a galvanometer than Professor Thompson had anticipated, but not in his mode of using it.

"Before the departure of the vessels from Keyham, the directors came down to examine the working of our instruments, with which I understood they were well satisfied. Professor Thompson's researches and rehearsals were at their height. The vessels left Plymouth for the Bay of Biscay to make an experimental trial in deep water, and returned having learnt much, but not perhaps all that such an opportunity might have taught. The expedition then set sail for mid-ocean. The terrible storm encountered by the *Agamemnon* must be in the remembrance of all. The vessels meeting subsequently in mid-ocean, the attempt was made to lay the cable, but without success. The third failure of the three then occurring seems to have involved the mechanical paradox of a sound cable being suddenly snapped by a strain far below that which it ought to bear, and which by examination afterwards the broken end was found able to bear. Close examination of the broken ends revealed nothing, and the paradox remains unsolved. Awaiting the arrival of the vessels, the chairman, vice-chairman, secretary, and several of the directors spent anxious days at Valentia, till at length came the unwelcome tidings of the failure, and of the *Niagara's* arrival at Queenstown. The result of this trial was so pre-eminently discouraging, that the warmest friends of the enterprise regarded the sailing of the ships on the next occasion more in the light of a forlorn hope, than of an expedition with any prospect of successful issue.

"The expedition again sailed, bearing with it the good wishes of all, and the sanguine hopes of few, if any, of those connected with the undertaking. That which seemed hardly to be in the engineer's power to accomplish by any effort of skill was effected for him by other agency. It is the opinion of one of the most competent to judge on board the *Agamemnon*, that the rough weather on this last occasion saved the cable. This he explained as arising from three causes. First, that it made them go faster than they otherwise would have done, and this greatly relieved the strain upon the cable. Secondly, that, the load on the breaks being thus rendered unnecessary, it was in a great measure removed, and thus a source of great risk greatly lessened. Thirdly, that on the commencement of rough weather it became obvious that the rise and fall of the stern of the ship alternately hastened and then retarded the movements of the wheels to such an extent as to make it certain that the inertia of the paying-out sheaves would shortly snap the cable. No compensation apparatus had been provided for this, nor could the steam

engine which had been fitted up on board be made to answer this purpose; but the hands of the sailors, guided and encouraged by their officers, performed this duty, regulating the run of the wheels with the rise and fall of every wave, day and night without intermission, from the commencement of rough weather on the first till the *Agamemnon* cast anchor at Valentia on the fifth of August. I have carefully looked over the published report of the engineer, and can find in it no allusion to this fact. Perhaps it escaped his attention. It should be brought prominently forward as a matter of the highest importance towards the successful laying of a future cable.

"By midnight on the fourth day after the landing of the end, the speaking instruments at Newfoundland were sufficiently adjusted for them to work. We received from them words at good speed and with perfect accuracy, which were recorded at times by use of my own instruments alone, at other times received also upon Thompson's galvanometer and recorded in the manner already described at Keyham, and sometimes by both systems simultaneously. Sentences and messages followed. The gradually decreasing strength of our current as received at Newfoundland, and reported by them, soon made it evident, however, that slight but gradually increasing injury to our cable at this end was a cause of embarrassment. This continued to increase till they were reduced to reading our signals by barely visible movement of their most sensitive detector—half a degree, while we received more than a hundred times this amount of force from them. Our mode of working was then modified to suit the altered condition of the conductor—voltaic current of low intensity being employed, and the signals being sent, at their request, much more slowly than before. Soon they ceased to receive even this feeble trace of communication from us, while yet their signals as received by us were of ample strength. After a time these also began to diminish very considerably in force, and it became evident that the injury was gradually increasing, and would shortly interrupt all communication either way. The peculiar mode in which this difficulty manifested itself pointed unmistakeably to the Valentia end as the seat of injury.

"The submersion of the shore end—always admitted to be necessary—and which ought to have been ready on the arrival of the ships, has been, in my opinion, unnecessarily delayed. It is now again, I hear, postponed, and May is spoken of by some of those immediately connected with the Company as the proper time for commencing operations. Meantime, no steps that I can ascertain have been taken since I left Valentia to prove the validity or otherwise of my opinion, further than multiplied appeals to a mode of testing demonstrably uncertain in the application to the present purpose. If the opinion which I formed and expressed as to the nature and seat of the injury should prove to be correct (and I have heard nothing since my resignation which leads me to think otherwise), the directors of the Atlantic Telegraph Company stand in a remarkable position. Having a success which has startled the whole world laid at their feet, they know not how to use it, but by apathy and incompetence suffer it to elude their grasp, and the grand enterprise of the day to fall into collapse.

"While penning these lines I am informed that communication from Valentia Island to the main land, hitherto established by means of a spare mile-length of the Atlantic deep-sea cable, has been for some days entirely interrupted in consequence of injury occurring within the harbour.

"Royal Institution, Albemarle-street,
Sept. 15, 1858."

The report from Mr. C. F. Varley states, that, 1. There is a fault of great magnitude between 245 and 300 miles from Valentia, but the locality cannot yet be more accurately ascertained. It is possible that the chief defect is in shallow water, of 410 fathoms. 2. That the copper wire at the faulty place does not touch the iron covering of the cable, as is proved by its forming a voltaic element which gives rise to a continuous positive current from the copper wire varying very little in tension. 3. The insulation of the wire between Valentia and the fault is perfect. 4. The copper wire is continuous, and consequently the cable has not parted. Faint signals or reversals are still received from Newfoundland, but the power used will shortly eat away the exposed copper wire in the faulty place by electrolytic decomposition. He considers there is another and more distant fault, the approximate locality of which he could not pretend to estimate without being able to speak to Newfoundland. From authentic data he is of opinion that there was a fault on board the *Agamemnon* before the cable was submerged, at a distance of about 560 miles from one end and 640 from the other. He is also informed that the currents through the cable, even immediately after it was submerged, were so weak that relays were useless, and that not one perfect message was recorded by them, everything that was received being read from the deflections of a galvanometer.

He concludes, by rough calculation, that

there was a fault offering a resistance equal to a 1,000 or 1,200 miles of cable, at about 160 miles from one end of the 1,200 miles coil on board the *Agamemnon*. This, however, cannot be the fault at about 270 miles from Valentia, but may have been the one which caused such alarm when the ships were 500 miles from Ireland, and when the signals ceased altogether and never certainly recovered. It is not at all improbable, he thinks, that the powerful currents from the large induction coils have impaired the insulation, and that had more moderate power been used the cable would still have been capable of transmitting messages. He has made experiments which prove that when there are imperfections in the insulating covering there is very great danger arising from using such intense currents. The size of the present conducting strand is too small, he says, to have worked satisfactorily, even had the insulation been sound. With a strand of larger dimensions less intense currents would be required, and both speed and certainty increased. It is not, however, altogether impossible that some intelligible signals may yet be received through the cable.

The document addressed to the Shareholders in the Atlantic Telegraph Company, by Mr. Saward, the Secretary, in reply to the assertions advanced by Mr. Whitehouse in his letters of the 6th and 15th respectively, and published at the desire of the Board of Directors, says Mr. Whitehouse's statements would have received earlier notice had it not been necessary to make investigations on the subject at Valentia and in London. "It must be understood that the present directors are in no way responsible for the introduction of Mr. Whitehouse into the electrical concerns of this Company, by which introduction he has derived an absolute bonus of £12,000 in free shares and a handsome salary." The following are stated to be the reasons which led the Board to the decision complained of by Mr. Whitehouse:—Although paid to conduct the Company's electrical operations, Mr. Whitehouse expressed himself prevented by "indisposition" from attending to by far the most important of his duties —that of accompanying the various expeditions, and ascertaining day by day the electrical condition of the cable when paid out. The charge of his department was on the last two occasions most kindly undertaken by Professor Thompson, on board the *Agamemnon* during all the privations incident to her two stormy expeditions, in order to relieve the paid electrician of the Company. On the arrival of the *Agamemnon* on the 5th of August at Valentia, after successfully laying the cable, summonses were sent out for a full meeting of the Board for receiving the reports of the scientific officers, &c. A telegram was subsequently sent to Mr. Whitehouse, at Valentia, requesting him to report fully to the Board on all points requiring attention. The Board met on the 9th, again on the 10th, and again on the 11th, but no report whatever was received from Mr. Whitehouse, nor any other communication except some telegrams informing the directors that signals were highly satisfactory, that the adjustment of instruments was progressing, and that it was necessary (a fact to which the directors were fully alive) that the shore ends of the cable should be laid as soon as possible. Professor Thompson left Valentia on the 10th to visit his family in Glasgow; prior to his doing so Mr. Whitehouse expressed an opinion to him that a defect existed in the cable in the harbour.

Professor Thompson, who knew intimately the state of all the cable as it emerged from the *Agamemnon*, strongly urged upon Mr. Whitehouse that this was not the case, and pointed to some considerable distance as the place where the fault would be discovered. He had not, however, left Valentia much more than forty-eight hours before measures were taken by Mr. Whitehouse for underrunning the cable from the shore to Dowlas Head, without any authority from the directors. The Board in London, during all this time, and up to the 14th, were kept in ignorance of Mr. Whitehouse's acts or opinions as to any faults in the cable, and received no written communication from him on the subject until the 19th, and then only in reply to repeated telegrams and a letter of remonstrance as to his inexplicable proceedings. Up to the 14th the telegrams from Mr. Whitehouse had all given satisfactory assurances, and on the 13th, at mid-day, the Board received from Mr. Whitehouse a message which was considered to be so highly satisfactory that the directors published it; "little thinking that at the very time they received it Mr. Whitehouse was secretly telegraphing to Mr. Canning, whose engagement with the Company had ceased when the cable was laid, stating that there was a fault in the cable, and asking him to come and underrun it." Mr. Canning proceeded at once to Valentia at Mr. Whitehouse's bidding; but the directors telegraphed to Mr. Whitehouse to abstain from any operations until they could ascertain the grounds upon which he had interfered with the duties of the en-

gineering staff without consulting the directors, whose reply he could have received in less than two hours. After this the Board began to receive telegrams from Mr. Whitehouse, stating (incorrectly) that the cable had received serious injury in the harbour, whereas the entry made in his own log on the 18th, when the cable was cut, and tested (after permission had been given to complete the underrunning, in consequence of the cable having been buoyed at Dowlas Head, without authority, and so left), shows that there was no loss of insulation between that point and the office which could at all explain any imaginable difficulty of working. There was no need for the interference of Mr. Whitehouse, as is evident from the daily records kept at Valentia. Professor Thompson, having returned to Valentia on the 21st, found the cable in worse condition than before Mr. Whitehouse had underrun it. The directors have called to their aid several other gentlemen, practically connected with the working of telegraphs, and these gentlemen, after having severally made their tests, concurred with Professor Thompson in stating that a variable fault was the cause of the obstruction, and that it exists at a distance of from 240 to 300 miles from Valentia. Some days previous to the 13th of August the directors, feeling convinced that Mr. Whitehouse was embarrassed by some practical difficulties in his instruments, desired that Mr. Whitehouse and the Company should have the advantage of the aid in this respect of Mr. France, of the Submarine and Mediterranean Companies (a practical telegraphist of very long experience in the testing and working of submarine cables), in the hope that thereby the line would the sooner be available for public traffic. After considerable difficulty they obtained Mr. France's services, and on the 13th of August he left for Valentia, the directors having previously advised Mr. Whitehouse that he was coming.

Mr. France bore a letter of introduction to Mr. Whitehouse, signed by the chairman, at the request of the Board, directing him to accept his aid, but, on his arrival at Valentia, he was prohibited by Mr. Whitehouse from entering the Company's premises, and on the same day a telegram was addressed by Mr. Whitehouse to the Secretary of the Company, proposing to employ Mr. France as a clerk, which was felt by the Directors to be a gross insult to themselves and Mr. France. A meeting of directors was therefore summoned for the 17th, a resolution was passed, intimating that, as Mr. Whitehouse's engagement as a paid officer ceased on the successful laying of the cable, the directors desired to terminate his further connexion with the Company in that capacity. Mr. Whitehouse was summoned to town to attend the managing committee on the 20th, on which occasion *two* members (and not *one*) were present. He was questioned by the vice-chairman in the most gentle manner as to his reasons for acting as he had done, but, instead of explanation or apology, he only dealt in a sweeping abuse of the Board and their proceedings, and distinctly intimated that on any future occasion he should act in precisely a similar manner; the Committee, therefore, had no alternative but to hand him a resolution passed by the Board on the 17th.

After explaining that Her Majesty's message was not transmitted by Mr. Whitehouse's instruments, but by Professor Thompson's galvanometer, the Secretary states that, notwithstanding an expenditure of some £13,000 in the department under Mr. Whitehouse's charge, the directors and shareholders have obtained no results in any way commensurate to those confidently promised by him. From the hour when the cable was laid it has not been possible for the currents from Newfoundland, when communicated direct to his apparatus, to work off unaided a single complete message; and these facts, in conjunction with the other matters of which they have had to complain, appeared, and do appear to them, to fully justify the course they have adopted.

In concluding, the directors communicate their views, so far as the present position of things enables them to judge. as to the state of the Company's property, They have sent out, with full instructions, one of the staff, and they are encouraged to hope that some communication may possibly yet be established through the cable for a time, even in its present state, and that, so soon as circumstances encourage an attempt with some chance of success to raise and repair the injured part, it is not beyond probability that the existing cable may be rendered permanently useful.

THE IRON TRADE.

(FROM OUR CORRESPONDENT IN STAFFORDSHIRE.)

Improved Condition — The Improvement general—The good Qualities in demand —Increased make of Pig Iron—Extension of the Iron Trade—Blast Furnaces of the North—Ascending Price of Pig Iron—Board of Trade Returns—How the suspended Iron Firms "cut up": better than was expected, both North and South—The Future of the Iron Trade hopeful—The Colliers' Strike.

DIFFERENT from some few months past,

we have at length to note some improvement in the iron trade of Great Britain.

There is considerably more doing now than there was a month ago. Although the aggregate is not very great, yet it is made up of a little from every district. In the revival the northern districts, Scotland, and South and North Wales were the first to feel the benefit; and lastly Staffordshire. In that county the new district (North Staffordshire) led the way.

North Staffordshire is making great progress in the developing of its metalliferous wealth, and in the improvement of the quality of the article manufactured. Because of the excellency of certain samples obtained from that district over others, it is said that a fortnight ago an eminent house as mechanical engineers sent a large maker there, not hitherto noted for the superiority of his iron, an order for some 800 tons, without a stipulation as to price. Most of the orders that are under execution in South Staffordshire also are, we rejoice to say, for iron of an excellent description.

In several directions new blast furnaces are being lighted up, or else some that were blown out at the crisis have been relighted. In South Staffordshire some few furnaces have again blown in. In the North, new and extensive iron works at Carr House, West Hartlepool, are expected to be opened shortly with 600 hands. Some new smelting furnaces are constructing at Seaham for the Marchioness of Londonderry. They have been placed under the management of Mr. Thorbury, formerly of the Workington Hematite Ironworks.

The *Newcastle Journal* gives the following statement of the position of the blast furnaces of that district.

Places and Firms.	Furnaces.	In Blast.
Eston, Bolckow and Vaughan.........	9	9
Eston, Messrs. Samuelson	3	3
Cargo Fleet, Cochrane and Co.	4	2
Cargo Fleet, Gilkes, Wilson, and Co.	4	2
Middlesboro, Bolckow and Vaughan	3	3
Port Clarence, Bell Brothers	3	3
Stockton, Holdsworth and Co.	3	2
Norton, Warner, Lucas, and Co. ...	3	1
Darlington, South Durham Company	3	2
Witton Park, Bolckow and Vaughan	4	3
Stanhope, Weardale Iron Company	1	out
Towlaw, Weardale Iron Company...	5	5
Consent, Derwent Iron Company ...	18	16
	63	51

Scotch pigs have gone up in price several times during the month; and Staffordshire makers are now firm at prices varying from £3 to £4. At these rates they refuse to sell for forward delivery. As the stocks of pigs are low in the hands of the makers of malleable iron it is probable that at the ensuing quarterly meetings Staffordshire pig iron will be higher in price than it now is.

The Board of Trade Returns for July show that the pig iron exported was in excess of the average, and also above that of 1856. There was a considerably increased exportation to Holland, and even to the United States, while the exports of bar and rod iron to India approximated in value very nearly to those of the corresponding month last year. The annexed figures show the value of the articles ennumerated under the several heads named in the respective years of 1856, 1857, and 1858.

Machinery: steam engines	70,796	98,614	99,676
" other sorts	186,084	299,527	215,385
Metals: pig iron	100,213	136,511	111,671
" bar and rod iron.....................	542,953	618,517	589,390
" iron wire	17,251	14,894	16,086
" cast iron	55,993	58,522	73,850
" wrought iron	327,372	330,706	306,685
" steel	59,553	78,452	55,993

The estates of the iron making or iron exporting firms that were compelled to succumb to the late monetary pressure, are either realizing more rapidly or are yielding a much higher percentage than was at first expressed. On the 21st of Sept., Messrs. J. and A. Dennistoun, of Glasgow, commenced to pay and are now paying the fourth instalment of their engagements on general account, with the fourth and last instalment on Australian account, due respectively on the 30th June and 31st of July, 1859. So much better are the South Staffordshire estates realizing, and of so much more value is the paper that has been afloat there, that the Wolverhampton and Staffordshire Bank, it is as yet only privately known, is in a better position now by at least £40,000 than it expected it would be when its affairs were scrutinized immediately after its unhappy suspension.

The future of the iron trade may therefore be said to be looming somewhat cheerfully, notwithstanding a little threatened inconvenience from the unsettled condition of the colliers in most parts of the kingdom on the question of wages.

SIR ISAAC NEWTON AS AN INVENTOR.

The following particulars of Newton's early life, from "School-days of Eminent Men," by John Timbs, F.S.A., will, doubtless, be read with interest in connection with the inauguration of the statue of the great philosopher at Grantham, on Tuesday last, the 21st inst. They show that the wonderful intellect of Newton was associated with a strong bias towards the pursuits of an inventor.

"Newton had not been long at school before he exhibited a taste for mechanical inventions. With the aid of little saws, hammers, hatchets, and other tools, during his play-hours, he constructed models of known machines and amusing contrivances, as a windmill, a water-clock, and a carriage to be moved by the person who sat in it; and, by watching the workmen in erecting a windmill near Grantham, Newton acquired such knowledge of its mechanism, that he completed a large working model of it, which was frequently placed upon the top of the house in which Newton lived at Grantham, and was put in motion by the action of the wind upon its sails. Although Newton was at this time a 'sober, silent, and thinking lad,' who never took part in the games of his school-fellows, but employed all his leisure hours in 'knocking and hammering in his lodging-room,' yet he occasionally taught the boys to 'play philosophically.' He introduced the flying of paper kites, and is said to have investigated their best forms and proportions, as well as the number and position of the points to which the string should be attached. He constructed also lanterns of 'crimpled paper,' in which he placed a candle, to light him to school in the dark winter mornings; and in dark nights he tied them to the tails of his kites, which the terrified country-people took for comets. Meanwhile, in the yard of the house where he lived, Newton was frequently observed to watch the motion of the sun; he drove wooden pegs into the walls and roofs of the buildings, as gnomons, to mark by their shadows the hours and half-hours of the day. It does not appear that he knew how to adjust these lines to the latitude of Grantham; but he is said to have succeeded, after some years' observation, in making them so exact, that anybody could tell what o'clock it was by *Isaac's Dial,* as it was called; and probably, about this time, he carved two dials on the walls of his own house at Woolsthorpe, one of which is now in the museum of the Royal Society. . . . When Newton had reached his fifteenth year, he was recalled from the school at Grantham to take charge of his mother's farm; he was thus frequently sent to Grantham market, to dispose of grain and other agricultural produce, which, however, he generally left to an old farm servant who accompanied him, and Newton made his way to the garret of the house where he had lived to amuse himself with a parcel of old books left there; and afterwards he would entrench himself on the wayside between Woolsthorpe and Grantham, devouring some favourite author till his companion's return from market. And when his mother sent him into the fields to watch the sheep and cattle, he would perch himself under a tree with a book in his hand, or shaping models with his knife, or watching the movements of an undershot water-wheel. One of the earliest scientific experiments which Newton made was in 1658, on the day of the great storm, when Cromwell died, and when he himself had just entered his 16th year."

ROBB AND WAUDBY'S REGISTERED ROOT SLICER AND CUTTER.

Messrs. Robb and Waudby, of Outwell, Cambridgeshire, have brought forward a registered root slicer and cutter, of which the following is an illustrated description.

Fig. 1.

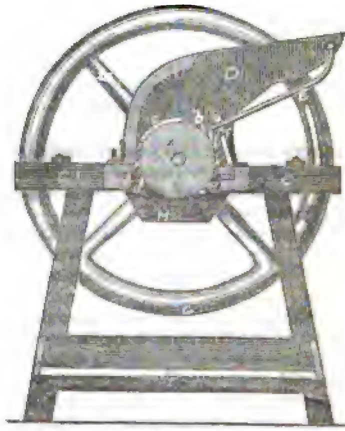


Fig. 2.

Fig. 1 is a sectional elevation, and fig. 2 a plan of part with the hopper removed. A is a drum, supported on the shaft, B, which

works in bearings, *a, a*, on the frame or support, C. Teeth, *b, b*, and knives, *c, c*, are fixed on the drum, A. As this drum revolves, the teeth, *b, b*, enter and pass between other teeth, *d, d*, fixed in blocks inserted in the cross frames; but the knives, *c, c*, are just free to pass the teeth, *d, d*. Roots to be sliced and cut are placed in the hopper, D, the lower part of which consists of a series of bars, E, the lower ends of which rest on a support, F. The back of the hopper is lined on the inside with metal, and is furnished with spikes. G is a fly-wheel, fixed on the shaft, B. As the roots pass through the machine they are sliced and cut by the teeth and knives, and fall through the outlet, H, on to the platform, I.

The utility arising from this design is the facility afforded for cutting and slicing roots.

HOLLIS AND LEE'S PATENT WAGON WHEELS.

Fig. 1.

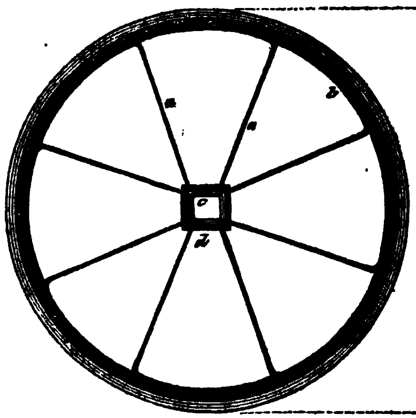


Fig. 2.

Fig. 3.

Messrs. Hollis and Lee, of Darlington, have introduced an improved method of making the wheels of chaldron and other railway wagons.

The invention is illustrated in the engravings annexed. Fig. 1 represents a front elevation of the wheel complete, with a square nave. Fig. 2 is a section of the same. Fig. 3 illustrates the connection of the parts of the rim at each spoke by means of a mortice and tenon joint, the same being shown with the tyre off.

They construct their wheels as follows:—They make the wheel, entirely of malleable iron, in four parts, of which two spokes, *a, a*, two portions of the rim, *b, b*, and one side of the nave, *c*, form one part. The spokes, *a, a*, are forged solid, or smithed and put together, with the piece forming one side of the nave, *c*, the latter being moulded to the shape shown in the engraving. The two pieces of the rim, *b, b*, are a continuation of the spokes bent to a mould and connected together at each spoke end, as shown at fig. 3, by means of a mortice and tenon joint. The four parts of the wheel (of which the construction of one part is described above) are fitted together, and the four nave sides of each part are secured together by two strong hoops, *d*, contracted thereon. The entire skeleton wheel is thus completed, and upon it the tyre is contracted and riveted in the usual manner. The axle is finally wedged in or keyed into the nave according to common practice.

Fire-Proof Strong Room for the New Gold District.—A large iron fire-proof strong room has just been supplied by Messrs. Chubb and Son to the Bank of British North America, and shipped to Vancouver's Island. The room is 7 feet high, 9 feet 4 inches deep, and 7 feet wide, and is constructed entirely of wrought iron, and lined with fire-resisting materials. The interior is fitted with nineteen separate and distinct lock-up safes, besides shelving for books and papers, and the exterior is secured by two large folding doors, having three detector locks throwing twenty bolts all round. The room was shipped in parts, and will be fastened together from the interior on arrival at its destination. The total weight is 13 tons and three-quarters of a cwt.

CONCUSSION FUZES AND ELONGATED PROJECTILES.

Gentlemen,—In his "Shells and Shell-guns," Captain Dahlgren, of the American navy, writes as follows:—

"In July, 1850, Captain Splingard suggested an explosive fuze, simple of construction, easy of preparation, quite inexpensive, and differing but slightly from the ordinary fuze in the facility and generality of its application. It is, moreover, entirely distinct from all other explosive fuzes yet invented, in the total absence of fulminating powder and every species of percussive mechanism. In the Splingard concussion fuze, the composition is driven on a spindle, as frequently practised in driving rockets; this leaves a conical cavity extending from the bottom well up into the mass of the hardened composition, precisely like that of a rocket. The interior surface of the cavity is then protected by a coat or two of shellac, and when this is perfectly dry it is filled with a paste of plaster of Paris and water, which, before becoming hard, is also pierced with another spindle, smaller than that used to drive the composition, and producing a cavity in the plaster also; so that, when dry, it forms an interior crust upon the composition. Now, at the time of firing, this casing of plaster, being fully supported, remains unbroken; but when the composition has been lighted, it consumes rapidly, and reaches the plaster cylinder, around which the combustion continues, and thus exposes it gradually; so that more or less of the upper portion is laid bare when the shock of impact takes place, and is fractured by it, opening a communication from the flame to the charge of the shell. There are several neat little contrivances by which the fuze is rendered better able to fulfil its functions."

From this description of the Splingard concussion fuze, I cannot see that it is more *simple* in its construction, or more certain in execution, than my concussion fuze, which was successfully tested from the 10-inch shell-guns at a range of twelve hundred and forty yards in the marshes at Woolwich, in presence of the Select Committee of Artillery Officers, and a great number of other gentlemen, in the year 1844, and on which fuze the Select Committee *officially* reported, that it was "simple, safe, and efficacious, being well adapted for horizontal fire with high velocities." My fuze is fully described in your Magazine. Compare Splingard's, as represented in p. 148 of Scoffern's "Projectiles," with my concussion, as represented in the *Mechanics' Magazine*, and say which is the more simple in construction. Dahlgren, speaking of the elongated shot for rifles, states that the Americans used them in 1827, long before they were used in Europe.

General Sir Richard Airey, a few months ago, in presence of Colonel O'Brien, Assistant Quartermaster-General, said to me, "I am ready to state, when called upon, that you brought forward your elongated rifle shot and shell at Woolwich in the summer of 1823, and that I saw you practically use them at that time; and added, *emphatically*, "I will *swear* to it if necessary." J. Norton.

Rosherville.

IMPROVED PROJECTILES.

Gentlemen,—Your observations on my letter which you did me the favour to publish in Number 1832 involves the necessity of my giving something more in explanation why I called attention to improved projectiles in the way I did, and I do so with every desire to see Captain Norton justly rewarded by the Government for his services, which, from some unjustifiable cause or other, up to this date, have not been recompensed. It appears to me, from what has come to my knowledge, Captain Norton should have been long since remunerated for the adoption by the Government of elongated projectiles, irrespective of such rewards as the War Department in justice may be called upon to make for farther improvement in such projectiles.

It will be recollected, in Number 1779, I stated my improvements in projectiles commenced in 1845, up to which I had not heard of conoidal shot of any kind, and it was while practising with the rifle in Mount Edgecombe Park, in Devonshire, the *solid* conoidal musket projectile was first described to me, when I immediately suggested its improvement by hollowing the base, to throw the centre of gravity before the middle of its length, and to fill up the cavity with cement. Seeing that it would lead the barrel objectionably by expanding, I suggested its farther improvement.

I am perfectly aware, Gentlemen, that, as you appropriately remark, "identity of *object* is not necessarily associated with identity of *invention*," as there are many mechanical modes for carrying out a principle; and I do not, as I originally stated, claim the merit of discovering the principle of elongated projectiles. My object for seeking the trial mentioned was, to produce a long and precise range with a smooth-bored musket, and to remove the leading of the barrel, so greatly complained of at Enfield, and by experienced riflemen both in and out of the service; and I will now give you one example out of many, by which it will be seen that I have anticipated the experienced veteran mechanically and also in motive, if the example lately pa

tented be the first invented by him for the same object. Had the Small Arms Committee sanctioned the trial which I sought for the good of the service, instead of refusing me the use of a "brown Bess," or an Enfield musket before rifling, Captain Norton would have known the results twelve months since, or he might have known in 1854 had the Woolwich Committee shown a disposition to make the trial when I first proposed "no-windage" elongated projectiles for its consideration.

In order to adapt the elongated projectile to the strength of "brown Bess," or the ordinary musket, it should not greatly exceed the weight of the spherical ball, as the weight of the ball governs the thickness and weight of the barrel, and consequently its length, which, if reduced, deprives the musket of its advantages for the line, by placing it on a par with the carbine; and it will be seen by the examples given, this rule is well observed by giving two calibres to its length; but for the unrifled Enfield musket two and a-half and even three diameters of the projectile may be used without straining the barrel dangerously.

Although the Small Arms Committee seemed not to see the advantages of producing a long range with a smooth-bored musket, as shown by their correspondence and report on my suggestions, I will not comment on this farther than observing it was not advancing the interest of the service to *refuse the inexpensive trial*; and, if the gentlemen who practise at Kilburn consider it worth their while to ascertain its value, they are perfectly at liberty to make use of my projectile, and I shall be most happy to give them any assistance in my power to dispose of a question now thought more important than when I discharged my duty by bringing it under the notice of the professional authority of the Crown.

Fig. 1 is a section of my first improved conoidal projectile, showing the advanced position of the centre of gravity, now considered by high professional authority as

Fig. 1.

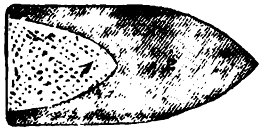
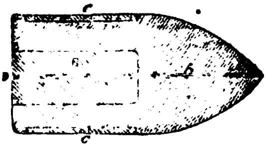


Fig. 2.



necessary to be given to all elongated shot or shell, rifled or unrifled. 1 is its old, and 2 its new position. Fig. 2 is a subsequent improvement.

A is lead, cast as usual. B is a wooden plug, turned to its size with the grain longitudinally,—hazel or fir, seasoned, will be the lightest, and sufficiently capable of resisting the impact in firing. C, thread or twine, bound round like a reel of cotton, to fit the bore close without windage. D, vent to allow the compressed air to escape in ramming down the projectile, if made to fit tightly to allow of no other escape, *should it be required*, and which it will not in breech-loading guns of any kind. Ordnance projectiles are the same, bound with twine, yarn, or leather; but this, although nearly the same as Captain Norton's invention, is not considered the best I have designed on the no-windage principle, neither is it the one I should prefer, either as it respects effect or economy, but I give it in consequence of your remarks, to show, as before observed, in which way Captain Norton has been anticipated, and I sincerely hope its publication will in no way affect his interest.

Let the Minister at War discharge his duty faithfully and honourably towards this gallant gentleman, to whom I am not personally known, and I feel quite sure he will command the approbation of every true friend of his country; and, if my humble exertions to improve the service be found worthy of subsequent consideration, let it be given on such grounds as no honourable man can object to, and more I have no right to expect, and will not attempt to seek.

I am, Gentlemen, yours, &c.,

JOHN POAD DRAKE.

London, September 18, 1858.

[Our Correspondent has very well discharged his duty in this matter; it only remains for us to remind him, that the present publication of his plan cannot interfere with the previous protection of Captain Norton's invention. If Mr. Drake's plan had been published in 1854, or at any time before the date of that protection, the case would of course be different.—EDS. M. M.]

LONDON DRAINAGE.

THIS all-important subject appears to be exciting as much interest as ever, and plan after plan advances and retires like the tidal way they would incontinently purify. The last notion deserving of especial mention is that of Mr. W. Baker (Henri and Co.), of Hull, who has patented his conception, and submitted a model to the public at McLean's-buildings, Shoe-lane, Holborn. Mr. Baker proposes a gigantic tunnel on one or both sides of the Thames. These tunnels are to be made of iron plates bolted firmly together, the top of each to form a promenade or wharf-room, whilst

underneath the sewage waters may flow to any point to be determined upon. The details appear to be well studied, the object being either to remove the sewage into the sea, or into tanks to render it available for manure. The tunnels as proposed are to be sixteen feet deep and fourteen feet wide, the cast-iron plates being welded together boiler-fashion, but all the nuts and screws to be inside, so that the exterior shall present a perfectly smooth surface to the shipping, &c., which may come alongside. These tunnels are to be laid on chains resting on well-driven piles at the bottom of the river, and secured the same as railway sleepers, all keyed in. The top part of the tunnels is to rest on the edge of the present wharves or edge of the river, the top forming a landing-place and promenade, with lamp-posts, electric telegraphs, etc. The models are well worth the inspection of all interested, and not the less so as they point to the employment of iron as the material to be used, a fact which has already influenced several ironmasters in the North in their calculations upon an advance in price consequent upon an enormously increased demand for the purpose. It would be curious if the long-desired Thames embankment should be consequent and coincident with its thorough purification.

THE ELECTRIC TELEGRAPH.

Gentlemen,—You may perhaps remember certain papers on the action of the atmosphere, light, air, and other subjects, which, in 1836 and subsequently, were inserted in the *Mechanics' Magazine*, to which pray allow me to recall your attention, because some doubt is intimated as to the origin of the Electric Telegraph. The Americans appear to claim the merit of originating it for Franklin and their philosophers; but to me it seems to have originated in the papers above mentioned, and the publicity given to them by the *Mechanics' Magazine*. It was not known until these papers were published that air and elastic fluids could permeate metals, and pass freely through them. If this truth had not been made known, philosophers might have written and lectured about electricity till Doomsday without producing the Electric Telegraph.

Some years since the papers referred to were collected and published in a small volume, entitled "Atmosphere," a copy of which I send to you by this day's post.*

I am, Gentlemen, yours, &c.,

G. Woodhead.

Old Hall, Mottram,
13th Sept., 1858.

* The Volume has been received with thanks.—Eds. M. M.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

Sievier, J. C. H. *Improvements in submarine conductors of electric telegraphs.* Dated Feb. 13, 1858. (No. 277.)

This consists in coating copper wire for submarine conductors with bismuth, tin, iron, lead, brass, antimony, zinc, nickel (by preference containing arsenic), or German silver, or with any two or more of these metals, prior to insulating the same.

Johnson, E. D. *An improved construction of chronometer case.* Dated Feb. 13, 1858. (No. 278.)

The object here is to prevent the air within the box of the chronometer from mixing with the outer atmosphere, or the external air from entering the chronometer case, either when the instrument is on shore or at sea. The delicate steel work will thus be preserved from corrosion. This result the patentee attains by various detailed improvements.

Spence, W. *Improvements in telegraphic apparatus.* (A communication.) Dated Feb. 15, 1858. (No. 279.)

This relates to the "Morse telegraph" and the "French telegraph," and has for its object the application to these of a mode of printing by means of a hammer moved by electricity upon a band of paper against a disc kept supplied with ink by an inking roller. The invention cannot be fully described without engravings.

Molinari, P. *An improved composition to be used externally for preventing sea sickness and illness arising from similar causes.* Dated Feb. 15, 1858. (No. 284.)

This consists in preventing sea sickness, &c., by the use of a preparation composed of vinegar, rue, thyme, mint, rosemary, absinth, turmeric, the green husks of walnuts, rocou, poppy heads, and potash. Wadding soaked in the preparation is applied to the pit of the stomach.

Tall, J. *Improvements in that description of carriages called perambulators.* Dated Feb. 15, 1858. (No. 285.)

The body of the carriage here admits of being expanded and contracted to carry one child or two; it is in two parts, the sides being slid towards or from each other.

Blyth, G. L. *An improvement in the manufacture of manure from sewage waters and other fluids containing ammonia or nitrogenous matters.* Dated Feb. 15, 1858. (No. 287.)

This consists in adding soluble phosphate of magnesia to sewage, and then precipitating with lime or other agent.

Cope, W. *Improvements in the manufacture of fabrics by bobbin net or twist lace machinery.* Dated Feb. 15, 1858. (No. 288.)

These relate to a fabric adapted for anti-macassars, window curtains and blinds, &c., such fabrics being composed of plaited or twisted pillars, formed by the working together of bobbin and warp threads, and connected together to form net by the laying in at intervals and from selvage to selvage of horizontal or transverse threads.

Sanders, H. J., and S. Thacker. *Improvements in machinery for the manufacture of textile and looped fabrics.* Dated Feb. 15, 1858. (No. 289.)

The patentees place the needles parallel and in a row equal to the breadth of the fabric, as in ordinary frames, but use needles with small beards or hooks, which are not pressed upon by pressers, the needles simply turning round on their own axes to retain the new loops and permit the work to slip off or be knocked over. The other parts are modified accordingly.

Newton, W. E. *Improvements in treating certain oils and fats, so as to effect the separation of constituent parts of such oils and fats.* (A communication.) Dated Feb. 15, 1858. (No. 290.)

The inventor treats certain oils and fats with a solution of carbonate of soda or potash, or of caustic soda or caustic potash, or with a mixture of lime and water. The alkali unites with and con-

verts into soap that part of the oil or fat which is of a soft quality, and separates the harder, which floats, and is applicable to the fabrication of candles, &c. The remaining saponaceous compound can be treated to produce useful soap, or be decomposed by acids to produce fluid oils or fats.

GARNETT, J. *An improved manufacture of paper.* Dated Feb. 15, 1858. (No. 291.)

A thin web of paper pulp is made on a Fourdrinier's machine, and when sufficiently consolidated by the couch roll and dry press the patentee causes it to be wound upon a reel and removed to another Fourdrinier's machine, mounting it on a frame between the coucher and dry press. He then removes the couch board from the top of the couch roller, and, having stopped the water used in the top of the coucher, he passes the web of paper tightly round the top couch roll upon the web of pulp of another colour made in the second machine. By the pressure of the couch roll and dry press, the two webs will be united, and, when passed through the remaining part of the machine, become a perfect web of paper of different colours on opposite sides.

WILDE, H. *Improvements in connecting the ends of lightning conductors, and also the ends of submarine electric telegraph cables.* Dated Feb. 16, 1858. (No. 293.)

Engravings are essential to a full description of this invention. The patentee dispenses with the use of solder.

ARMITAGE, W. *Improvements in looms.* Dated Feb. 16, 1858. (No. 294.)

This relates to looms in which a duplicate fabric is woven either as a bag or round piece with one or both of the selvages united, or for weaving two separate fabrics. Instead of placing the shuttle boxes on pivots or hinges so as to be alternately in an inclined position (as has already been done), the patentee works them horizontally by rods and levers moved by a cam or tappet, the movement of the boxes being so arranged as to receive each shuttle when shot simultaneously from the opposite box.

DAFT, T. B. *Improvements in instruments for rubbing out pencil marks and for sharpening pencils.* Dated Feb. 16, 1858. (No. 295.)

This consists in covering a small block (say of wood) with sheet india rubber. Attached thereto is a blank cut from a sheet of steel, to form a hollow cone, one edge of which is to be sharpened to point pencils.

BOYD, J. E. *Improvements in lawn and grass mowing machines.* Dated Feb. 17, 1858. (No. 300.)

This consists of an apparatus formed of brushes or scrapers, composed of iron or other metal, having bristles, hair, or metal wire combined therewith. This apparatus is so arranged as to come into contact with or bear upon the revolving cutters or knives, so that, by such contact, the cutters may be cleansed from the lodgments of any matter thereon.

BAKER, G. and J. E. *New or improved machinery for compressing and moulding powders and pastes.* Dated Feb. 17, 1858. (No. 301.)

This cannot be described without engravings.

HEYNS, P. *Improvements in wheels and axleboxes.* Dated Feb. 17, 1858. (No. 302.)

This consists in forming the hub of plate metal, in two parts, one having radial recesses, into which the inner ends of the spokes (made of wood) are driven. When in position, the second portion of the hub is brought up to the first, so as to bear against the sides of the spokes within the recesses, and bolts are passed through the whole and through the centre of each spoke, so as to secure the whole together. The felloes and tires are then fitted on in the usual way.

RIDDLE, W. *Improvements in apparatus for binding and fastening bales and other articles.* Dated Feb. 17, 1858. (No. 304.)

This consists in forming each metal or other band with hooks or bent ends, held, when hooked together, by a ring or slide.

PIDDINGTON, J. *Improvements in the manufacture of fuel, commonly called artificial or patent fuel.* Dated Feb. 18, 1858. (No. 306.)

This consists in the application of certain ingredients for agglomerating small coal or slack. The patentee first combines powdered resinous matter, or the refuse of soap or varnish manufacturers, with farinaceous substances, preferring damaged flour. Also, in some instances, he adds substances rich in oxygen, such as manganese, &c.

CUVELIER, E. *Improvements in steam engines.* Dated Feb. 18, 1858. (No. 307.)

This relates to the slide valves of steam engines, and cannot be described without engravings.

NEWTON, W. E. *An improved optical instrument, which the inventor denominates a "tropescope."* (A communication.) Dated Feb. 18, 1858. (No. 309.)

This consists of a new optical instrument which the patentee designates a "tropescope," and which cannot be described without engravings.

CLARIDGE, G., and R. S. ROPER. *An improved mode of manufacturing coke.* Dated Feb. 18, 1858. (No. 310.)

The object here is the carbonisation and desulphurising of coal by the application of combustible gas or gases and of steam.

BLAIR, H. *Certain improvements in the method of recovering the sulphur which has been used in the manufacture of soda ash, and in the apparatus connected therewith.* Dated Feb. 18, 1858. (No. 313.)

This consists in the use of carbonic acid for the decomposition of "vat waste." The carbonic acid is to be obtained by the action of the residue from chlorine upon limestone, or by the combustion of coke, or otherwise.

JONES, F. *Certain improvements in machinery or apparatus for cutting "piassava," or other fibrous substances employed in the manufacture of brushes, which said improvements are also applicable to other purposes of cutting.* Dated Feb. 18, 1858. (No. 314.)

Two upright bars slide vertically in V grooves, to which bars are attached cutters, and a vertical reciprocating motion is imparted thereto by cranks upon a shaft driven by spur gearing. The "piassava," cork, &c., to be cut is placed in an adjustable gauge and contained therein by a pressing lever, whilst the knife descends.

BEATTIE, J. *Improvements in locomotive and other steam engines, parts of which improvements are respectively applicable to other purposes.* Dated Feb. 19, 1858. (No. 315.)

This consists in having the internal and external shells of the furnaces, or either of them, corrugated, indented, or curved, and held together by hollow stays or tubes passing through the water spaces and fastened into such shells.

RILEY, W. *An improved method of raising and lifting water from the bilge or holds of ships and other vessels, and in a peculiar construction and arrangement for effecting the same.* Dated Feb. 19, 1858. (No. 316.)

This is more particularly applicable for raising and lifting bilge water in ships. After the water has been let into wells by valves opening one way, it flows into the apparatus, which consists of a water-tight framing balanced on a centre having a number of inclined planes in a zig-zag position; in each of these inclined planes is a valve opening upwards only, so that when a vessel is rolling and the "pump" kept stationary the rolling motion will raise the water from one inclined plane to another, until it reaches above the water line, when it can be allowed to flow into the sea again. When a vessel is quite steady, by oscillating the "pump" it will raise the water from the wells in the manner described.

GRIFFITHS, R. *Improvements in screw propellers and apparatus for governing engines used to give motion to screw propellers.* Dated Feb. 19, 1858. (No. 319.)

It is found that the back of the ordinary screw is quickly worn by the action of the water, and this wearing, doubtless, represents an action retarding

the ship. In order to counteract this action the patentee so constructs the screw that if a straight edge is laid on the propelling face of the blade perpendicularly to the axis, it will be found that at a point at a distance from the axis (generally of about half the radius of screw) the straight edge and the blade part company, the blade falling forwards towards the ship; or the screw may be so constructed that the blade shall continually fall away from a straight edge so applied from the boss to the extremity of the blade.

COOK, J. E. *Improvements in binnacles or apparatus for holding marine compasses.* Dated Feb. 19, 1858. (No. 323.)

The actual holding part of this binnacle consists of a metal cylinder within which is a second cylinder of cork, an annular space of considerable width being left between the two cases. The inner case has within it apparatus for holding the compass. The metal preferred for the outer case is "homogeneous metal," and the space between the two cases may either be left open or filled up with any non-conducting material. This arrangement has, it is said, the effect of nullifying local attraction.

CLARK, W. *Improvements in filtering water, and in apparatus for the same.* (A communication.) Dated Feb. 19, 1858. (No. 325.)

This relates to a continuous-pressure filter for filtering a large quantity of water very rapidly (the filter being small) by means of pressure obtained either from a lift and force pump, or from a head of water. The filtering material is very fine sand compressed by diaphragms.

NETHERSOLE, W. E. *Improvements in the construction of parts of railway carriages.* Dated Feb. 20, 1858. (No. 326.)

By removing the side-chain springs from the inside of the headstocks, and by the introduction of other apparatus, the patentee takes the strain off the wagon frame or headstocks, and renders the side chains much less liable to breakage, by giving them the advantage of doubling the spring they now have, without the addition of springs. He places two small cradles, one on each side of the larger one, in which the ends of the draw bars now work. They are attached to the larger one by lugs, which slide on the side bars of the larger cradle, but work independently of it or each other. The side-chain springs are attached to the small cradles, the eye bolt of each side or coupling chain being lengthened, so as to pass to the springs therein. The lugs tend to keep everything in place, and, in the event of rupture of a draw bar, they prevent the cradle from being drawn through the transoms.

EDWARDS, H. *Improvements in stoppers for feeding bottles and other vessels.* Dated Feb. 20, 1858. (No. 330.)

Each stopper is made with a passage through it, larger at one end than the other, the larger end being towards the interior of the vessel. In the passage is applied a plug fitted accurately to the passage, and there is a stem which passes to the exterior of the stopper, which, when pressed on, causes the plug to move inwards, and thus admit air to flow into the vessel, and also, in some vessels, to admit of the fluid flowing out through the stopper. The plug is constantly pressed outward by a spring.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

ANDERSON, R., and J. J. PRESCOTT. *Improvements in lubricators.* Dated Feb. 16, 1858. (No. 292.)

The inventors employ fine wire gauze in the interior of lubricators for straining the oil, &c., in combination with other modifications of the parts which would require illustration.

MENNONS, M. A. F. *Certain improvements in voltaic batteries.* (A communication.) Dated Feb. 16, 1858. (No. 296.)

This consists in the use of aluminium as a substitute for "zincode."

NEWTON, A. V. *Improved apparatus for laying submarine telegraph cables.* (A communication.) Dated Feb. 16, 1858. (No. 297.)

This consists in gearing rotary pumps with the shafts of the paying-out drums, the said pumps having small discharge pipes, so that by the continual drawing and forcing of water by the pump great force may be consumed, and the rotary motion of the drums retarded. It also consists in an automatic regulating apparatus for controlling the area of opening of a valve in the discharge pipes, so that more or less force may be consumed, as the velocity of the drums may require to be more or less retarded. Also in constructing each of the paying-out drums (when provided with more than one groove to permit of the cable passing more than once round) of sheaves, each groove being a separate sheave, and one of the sheaves being fast to the shaft of the drum, while the others are loose thereon but clamped to the fast sheave, so as to produce considerable friction between them.

COUTTS, J. *An improved paint, pigment, or composition, more particularly adapted for coating the hulls of ships, either iron or wooden, so as to prevent damp, corrosion, or fouling, and apparatus for drying and warming surfaces, and preparing and applying to the same such paint, pigment, or composition.* Dated Feb. 16, 1858. (No. 298.)

This consists of a paint, pigment, or composition composed of poisonous substances, warmed by part of a certain hot-air apparatus and applied to a dried or heated surface, as a protection from decay or fouling.

VARVILL, R. *A certain improved apparatus for washing clothes or other articles of wearing apparel.* Dated Feb. 17, 1858. (No. 303.)

This consists of a chamber, near the bottom of which is fitted a false or spring bottom perforated, and having upon its upper surface ribs or corrugations. Within the chamber is placed a beater or rubber composed of a series of rods in the form of a segment of a circle, so that it may rock or move backwards and forwards upon the false bottom, the ribs upon such surface fitting between the ribs of the rocking beater or presser.

YELVERTON, W. H., and O. BOWEN. *An improved manufacture of coke.* Dated Feb. 17, 1858. (No. 305.)

This consists in making coke from a mixture of anthracite or stone coal with a soft or bituminous coal.

CRISPIN, W. H. *Improvements in the construction of bearings, beds, and sockets for axles, shafts, pivots, and other rotating parts of machinery.* Dated Feb. 18, 1858. (No. 308.)

This relates to arrangements whereby the development of heat in bearings may be diminished; and, with this view, a chamber is constructed in the bearings, a continuous stream of water being allowed to flow through the same, by means of suitable tubes and apertures.

JOHNSON, J. H. *Improvements in machinery or apparatus for making bolts and rivets.* (A communication.) Dated Feb. 18, 1858. (No. 311.)

This relates to an improved apparatus for pressing bolts and rivets, either hot or cold, and to another for throwing the machine out of gear when the strain upon it becomes unduly great.

CHADWICK, J. *Improvements in machinery or apparatus for engraving printing surfaces.* Dated Feb. 18, 1858. (No. 312.)

This relates to apparatus for effecting the operation of engraving cylinders or other surfaces, or the production of printing surfaces, by self-acting means.

PROVISIONAL PROTECTIONS.

Dated August 4, 1858.

1774. J. B. Pascoe and J. R. Thomas, of Chacewater, Cornwall, engineers. An improved method of and apparatus for feeding boilers of all steam engines with liquid, without the aid of the force pump heretofore used.

Dated August 6, 1858.

1790. C. Barthélemy, of Bush-lane. Certain improvement in hats.

Dated August 10, 1858.

1820. R. H. Collyer, M.D., of Park-road, Regent's-park. An improved coating composition to protect vessels from marine animal and vegetable substances.

Dated August 11, 1858.

1824. J. T. Pitman, of Gracechurch-st. An improved mode of operating apparatus for lifting and pressing. A communication.

Dated August 20, 1858.

1900. A. Baker, of Boston, United States. An improved method of and apparatus for submerging or laying under water electric cables, wires, or lines, and for the recovery thereof.

Dated August 28, 1858.

1950. J. Ireland, of Manchester, foundry engineer. Improvements in cupola furnaces.

1952. W. Foster, of Black Dike Mills, near Bradford, York, spinner. Improvements in the manufacture or production of fabrics known as fancy moreens.

1954. J. D. Brabazon, of St. Alban's-place, Haymarket, esq. Improvements in giving motion by sails to screw and other propellers of ships and vessels.

Dated August 30, 1858.

1958. E. Massey, of Tysoe-st., Clerkenwell, ship's log maker. Improvements in ship's logs.

1960. G. Davies, of Serle-st., Lincoln's-inn. Improvements in billiard tables and cues. A communication.

1964. G. Jones, of Pimlico, slate merchant. Securing joints in slate ridge roll.

1966. E. Lindner, of New York, engineer. Improvements in breech-loading fire-arms and ordnance, and in cartridges.

1968. T. R. Harding, of Leeds, machinist. Improvements in the method of making straight or circular combs for flax, wool, or silk machinery.

Dated August 31, 1858.

1970. E. Spary, of Brighton, nurseryman. Improvements in fumigators.

1972. M. A. F. Mennons, of Paris. Improved apparatus for the elevation of liquids. A communication.

1974. F. Ayckbourn, of Lyon's-inn, Strand, gentleman. Improvements in the construction of beds and other articles for sitting or reclining upon.

1976. D. Heyworth, manager, of Littleboro, Lancaster, and J. Heyworth, manager, of Hebden-bridge, Yorkshire. Certain improvements in looms for weaving.

1978. A. V. Newton, of Chancery-lane. An improvement in gas burners. A communication.

1980. A. V. Newton, of Chancery-lane. Improvements in air engines. A communication.

Dated September 1, 1858.

1982. W. Pursall, of Birmingham, percussion cap maker. Improvements in the manufacture of percussion caps.

1984. W. Hobbs, of Piccadilly, shop fitter. Improvements in ordnance and warlike projectiles to be used therewith.

1986. H. C. Jennings, of Great Tower-st., chemist. Improvements in the manufacture of artificial parchment, and converting the same into leather.

1990. W. E. Newton, of Chancery-lane. Improvements in springs for carriages and other purposes. A communication.

Dated September 2, 1858.

1992. J. Walker and J. Barnes, of Oakenshaw, Lancaster, waterproof cloth makers. Improvements in blankets and lappings for machine and block printing and other similar purposes.

1993. G. Price, of Wolverhampton, safe manufacturer, and W. Dawes, of Wolverhampton, engineer. Improvements in steam engines, steam boilers, and apparatus connected therewith.

1955. J. T. Pitman, of Gracechurch-st. An improvement or improvements in the construction of pneumatic condensing apparatus for the purpose of compressing air, aeriform or gaseous bodies, preparatory to their use as prime motors, or for other purposes. A communication.

1996. B. Winstone, of Shoe-lane, printing ink manufacturer. An improvement in the composition of copying and writing inks.

Dated September 3, 1858.

1997. J. M. Bellanger, of Paris, shoemaker. Caoutchouc socks or clogs with springs and without bridles.

1998. J. Robertson, of Glasgow, engineer. Improvements in driving belts and springs.

1999. W. Harkes, of Lostock Gralam, Chester, agricultural implement maker. An improved plough and pulverizer.

2000. E. Cocker, of Newton-heath, near Manchester, mill manager. An improvement or improvements in machinery for spinning, twisting, or doubling cotton, flax, silk, wool, or other fibrous materials.

2001. G. T. Bousfield, of Brixton. Improvements in knitting machinery. A communication.

2002. R. A. Brooman, of 166, Fleet-st., patent agent. An improved apparatus for supporting the skirts of ladies' dresses. A communication.

Dated September 4, 1858.

2003. A. Guye, of Clerkenwell. Improvements in the escapement of chronometers and watches.

2004. R. P. Lavie, of Paris. Improvements in mills.

2005. R. A. Brooman, of 166, Fleet-st., patent agent. Improved apparatuses for receiving, containing, and delivering liquids. A communication from J. C. J. L'Hôte, of Paris.

2006. W. H. Child, of Providence-row, brush manufacturer. Improvements in hair and skin brushes.

2007. W. P. Piggott, of Argyle-st., Regent-st., and S. Beardmore, of Upper Berkeley-st. Improvements in vinous and fermented liquors.

2009. A. V. Newton, of Chancery-lane. An improvement in fire-arms. A communication.

2010. H. Hyde, of Truro, Nova Scotia, gentleman. Improvements in the construction of carriage springs. A communication.

2011. A. Hills, of Blackheath, gentleman. A method or methods for the better securing the integrity or genuineness of bankers' cheques on orders for money.

Dated September 6, 1858.

2013. S. Hoga, of Nassau-st., Middlesex Hospital, W. P. Piggott, of Argyle-st., Regent-st., and S. Beardmore, of Upper Berkeley-st. Improvements in submarine electric telegraphs.

2016. J. Ramsbotton, of Accrington, engineer, and T. Watson, of Baxenden, overlooker. Improvements in machinery or apparatus for weaving.

2017. H. J. Distin, of Great Newport-st., Leicester-sq., musical instrument maker. Improvements in cornets and other musical wind instruments.

Dated September 7, 1858.

2019. W. S. Champness, of Clapham-road, gentleman. Improvements in syringes for male and female use.

2021. E. Fullwood, of Bristol, cement maker. Improvements in the manufacture of cements.

2025. G. Larsonnier, of Paris, manufacturer, and A. Blanche, of Paris, civil engineer. Improvements in block printing by hand on tissues, paper, or other suitable fabrics.

Dated September 8, 1858.

2027. B. Hockin, of Gateshead. Apparatus for repairing and fitting dockgates and their machinery.

2029. J. O. Butler, of Kirkstall Forge, near Leeds, engineer. Improvements in weighing cranes. A communication.

2031. A. Lamb, of Southampton, and J. White, of Cowes. Improvements in life-boats.

2033. C. Bartholomew, of Rotherham, and J. Bell, of Swinton. Improvements in pistons and safety-valve levers of steam and other engines.

2035. J. U. Faessler-Petzi, of Lyons, merchant. An improved process for the boiling off of tussah silks or wild silks.

2037. A. McE. Peters, of Edinburgh, plumber. Improvements in apparatus for regulating the flow or passage of fluids.

NOTICES OF INTENTION TO PROCEED.

(From the "London Gazette," September 21st, 1858.)

1033. J. T. Robson. "Boilers." A communication.
1036. A. V. Newton. "Waterproof fabric." A communication.
1046. W. G. Taylor. "Rollers for spinning."
1047. J. B. Pim and C. Payne. "Recovering matters from oil cloth," &c.
1053. J. Soutter. "Washing machines."
1054. W. Pare. "Bedsteads."
1058. R. Halliwell. "Spinning and doubling."
1060. J. M. Gilbert. "Cylinders and maundrils."
1063. L. Durand. "Steam generator."
1064. M. Diosy. "Preserving potatoes." A communication.
1070. J. Sharples. "Extracting moisture."
1071. R. Knight. "Refrigerating; bottling aerated liquids; artificial mineral waters."
1079. A. M. Dix. "Obtaining decoctions," &c.
1082. H. Hyde. "Oils." A communication.
1085. J. Colgate. "Pipe-case handle for sticks."
1090. J. Macintosh. "Telegraphic wires."
1097. W. H. Bagnall. "Stove grates."
1103. R. Imeary and T. Richardson. "Roasting pyrites."
1108. E. C. Brochand. "Travelling mill and millstones."
1132. M. Henry. "Ink and paper; preserving food," &c. A communication.
1135. J. Apperly and W. Clissold. "Condensing wool."
1138. W. Clark. "Peat." A communication.
1175. R. H. Nicholls. "Taps."
1176. J. Luis. "Baking clay." A communication.
1419. R. Armstrong. "Boilers and furnaces." Partly a communication.
1735. J. Houston. "Consuming smoke."
1834. G. Houghton. "Saddles."
1836. G. Metzler and J. Waddell. "Musical instruments."
1914. A. Boyle. "Umbrellas."
1958. E. Massey. "Ships' logs."
1985. J. Sloper. "Checques, drafts," &c.
1987. W. Warne. "Elastic pavements, linings for walls," &c.
2023. W. Tucker. "Boring bit."
2037. A. McE. Peters. "Regulating fluids."
2083. J. Luis. "Moulding." A communication.

The full Titles of the Patents in the above List can be ascertained by referring back to their numbers in the Lists of Provisional Protections previously published.

Opposition can be entered to the granting of a Patent to any of the parties in the above List who have given notice of their intention to proceed, within twenty-one days from the date of the Gazette in which the notice appears, by leaving at the Commissioners' office particulars in writing of the objection to the application.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

2070. J. H. Tuck.
2086. W. Sangster.
2088. D. Zenner.
2089. L.D. B. Gordon.
2091. J. Gray.
2102. R. A. Brooman.
2106. R. A. Brooman.
2113. G. A. Biddell.
2119. J. Page and W. Robertson.
2168. J. Good.

LIST OF SEALED PATENTS.

Sealed September 17th, 1858.

538. W. S. Clark.
541. W. and J. Todd.
547. R. A. Brooman.
550. L. E. Fletcher.
555. A. Dunlop and A. Stark.
556. T. Suffield.
563. P. F. Aerts.
564. H. Brocklebank.
565. G. Scott.
573. J. Young.
574. J. Bramwell.
581. R. Mills.
585. J. Le Franc.
588. J. T. Pitman.
592. J. Thomas.
597. I. Holden and E. Hubner.
615. C. Chevallier, M. I. Olivier, & E. Rollan.
620. G. A. Biddell and W. Balk.
626. D. A. Hopkins.
628. J. Nuttall.
632. F. Foucou.
652. W. T. Eley.
658. W. Garnett, C. Geldard, & J. Dugdale.
662. J. Horton.
680. J. Musgrave, jun.
698. W. E. Newton.
706. A. Pelez.
800. W. E. Newton.
832. J. Luis.
964. B. L. A. Peaucellier.
965. E. T. Hughes.
1416. C. Vero and J. Everitt.
1420. Sir J. Paxton.
1452. J. Luis.
1528. J. D. Weston.
1562. M. A. F. Mennons.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions.

LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

Dates of Registration.	Nos. in the Register.	Proprietors' Names.	Addresses.	Subjects of Design.
Aug. 25	4114	C. Weintraud, jun.	Offenbach, O. M.	Fastening.
,,	4115	W. Broughton	South-street, Finsbury	Kitchen Range.
30	4116	G. Barnes	New-court, Goswell-street	Braces.
,,	4117	A. Brouse	Compton	Hassock.
Sept. 15	4118	T. Patstone	Birmingham	Lamp.
20	4119	Robb and Waudby	Outwell	Root Slicer.

PROVISIONAL REGISTRATIONS.

Aug. 25	1008	J. H. Glew	Charlotte-street, Fitzroy-square	Boot.
25	1009	E. Cook	Aston New Town	Pulley.
26	1010	A. J. Thorman	Lime-street, City	Chair.
Sept. 4	1011	Lovell and Wilson	Wine-office-court	Inkstand.
6	1012	H. Searle	Oxford	Pencil.
16	1013	W. A. Bonella	Finsbury	Stub or Pin.
,,	1014	E. Addenbrook	Birmingham	Blind Regulator.
18	1015	F. A. Piltz	Bryanston-square	Bedstead.
20	1016	H. Emery	Cheapside	Jupon.

NOTICES TO CORRESPONDENTS.

The letters of Mr. Dick and Mr. France reached us too late for insertion in this Number. Mr. Fowler's letter is under consideration.

Articles and Correspondence designed for insertion in the ensuing Numbers of the *Mechanics' Magazine* must reach the Office by the Tuesday of each week, at the latest. It is highly desirable that they should be forwarded earlier if possible.

CONTENTS OF THIS NUMBER.

LONDON: Printed and Published by Richard Archibald Brooman, of 166, Fleet-street, in the City of London. Sold by A. and W. Galignani, Rue Vivienne, Paris; Hodges and Smith, Dublin; W. C. Campbell and Co., Hamburgh.

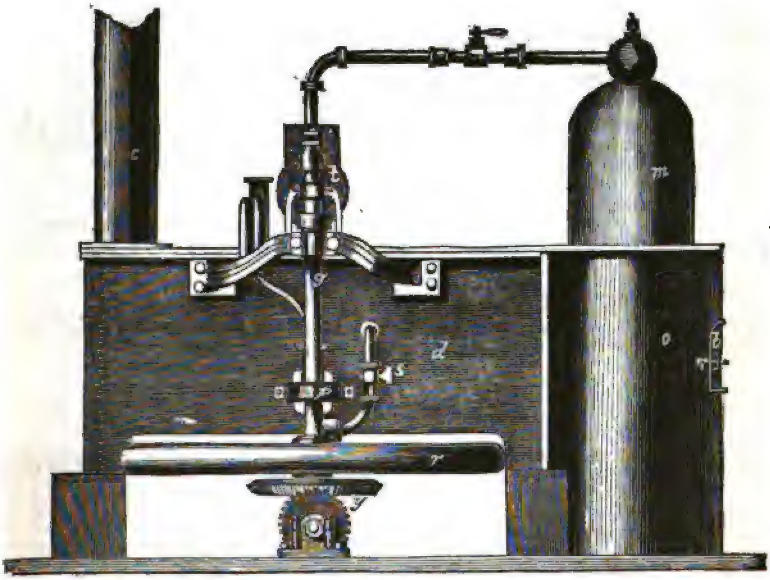
Mechanics' Magazine.

No. 1834.] SATURDAY, OCTOBER 2, 1858. [PRICE 3D.

Edited by R. A. Brooman and E. J. Reed, 166, Fleet-street, London, E.C.

NEVILLE AND DORSETT'S PATENT BOILERS AND STEAM ENGINES.

Fig. 1.



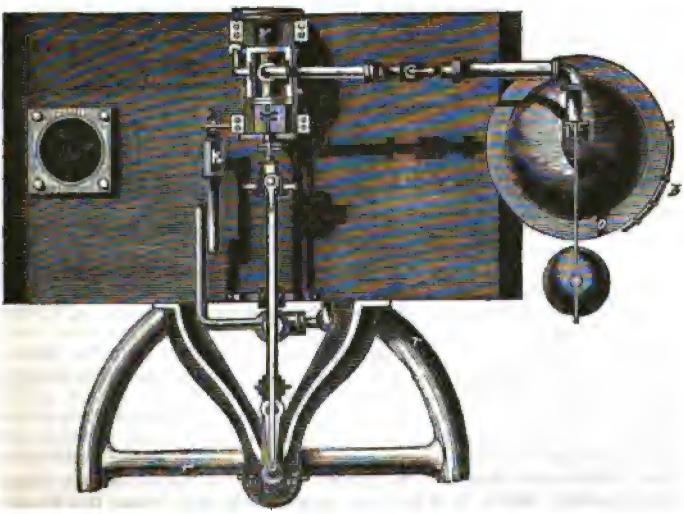


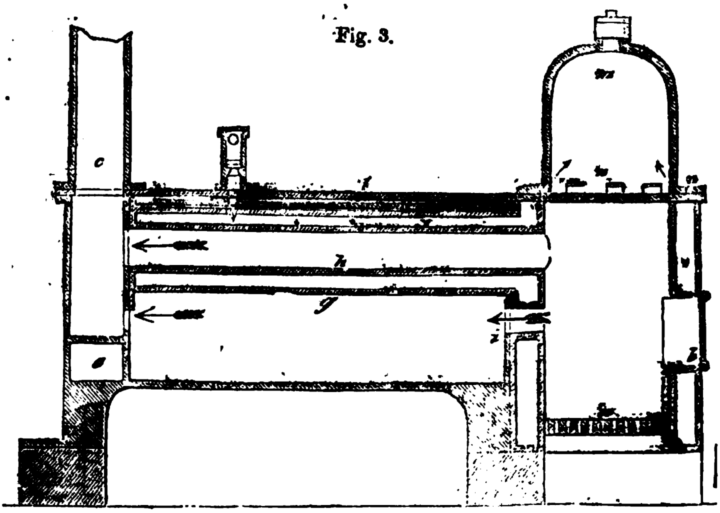
Fig. 2.

NEVILLE AND DORSETT'S PATENT BOILERS AND STEAM ENGINES.

Mr. T. Neville, C.E., of Lichfield, and Mr. W. S. Dorsett, of Aldridge, Stafford, have patented certain improvements which are illustrated in the combined steam boiler and engine represented in the accompanying engravings. Fig. 1 is a side elevation, fig. 2 a plan, and fig. 3 a transverse section. *a* is the furnace or fire-box, and *b* is the door. The heated air and products of combustion pass from the furnace, *a*, in the direction indicated by the arrows in fig. 3, and escape by the flue or chimney, *c*. On either side of the passages along which the heated air from the furnace passes cisterns or reservoirs are situated, communicating by means of the channel, *e*, with each other. The cisterns and channel, *e*, are filled with the water to be converted into steam, maintained at or near the boiling point by means of the heat from the furnace, *a*. The water thus heated is injected by the force pump into the generator, which consists of two concentric tubes, *g*, *h*. The fire from the furnace passes through the interior of the tube, *h*, and also circulates about the exterior of the tube, *g*, gaining access to the whole exterior of the tube, *g*, through the passage, *i*. The water to be injected, after passing from the force pump through the valve, *k*, enters the narrow channel, *l*, passing along the top of the tube, *g*, and is delivered through a series of holes.

By the arrangement described the water is thrown in the form of a spray upon the tube, *h*, and is immediately converted into steam, which passes along the annular space enclosed between the tubes, *g* and *h*, into the space, *o*, around the fire-box, where there is always a small quantity of water in a state of vaporization. The steam accumulates

Fig. 3.



in the dome, *m*, through the passages, *n*. The dome, *m*, being in communication with the jacket, *o*, the steam becomes superheated. As the water is injected into the generator at a point distant from the fire, the steam produced in passing to the dome, *m*, passes through the most strongly heated portion of the generator into the space, *o*, around the fire-box, whereby any suspended particles of water are vaporized. The force pump is worked by an eccentric, *p*, on the main shaft, *q*, of the engine.

The patentees prefer to make the generator, *g*, *h*, and fire-box, *a*, of copper, and defend one or both of them by a jacket or case of iron.

On starting the engine the force pump may be actuated by hand, for which purpose the shaft, *q*, may be turned by means of the fly wheel, *r*; or the pump may be so constructed as to be capable of being readily ungeared from the said shaft, *q*. The force pump may be so constructed that the quantity of water it delivers at each stroke can be regulated with great nicety; or the quantity of water injected may be regulated by the stop-cock, *s*; or the supply of water may be regulated by a governor of the ordinary construction driven by the engine. Two or more generators with their fire-boxes may be connected together, the shaft of the engine being situated (when two are employed) between them.

Their improvements further consist in applying to steam engines a horizontal fly-

wheel, *r*, instead of the vertical one ordinarily employed. The fly wheel is attached to the main shaft, *q*.

By the arrangement of the parts of the engine as represented, and the use of the horizontal fly wheel, *r*, much space is saved. Both the steam boiler and steam engine are considered to be especially adapted for marine purposes; the plan being to drive the screw shaft direct from the horizontal fly wheel. By their use a great saving may, it is supposed, be effected both in space, and in fuel, and expenses connected with steam navigation. The cylinder of the steam engine is marked *t*; the piston rod is geared in the usual manner to the crank on the main shaft of the engine. The slide valves are worked by a connecting rod geared to the crank of the engine; *y* is bevel gearing, by which the rotation of the vertical shaft, *q*, is transmitted to the horizontal shaft.

MR. W. G. ARMSTRONG, C.E., F.R.S., ON WATER-PRESSURE MACHINERY.

(Concluded from p. 269.)

With regard to the pumping engine used for charging the accumulator, the most approved form is that of two high-pressure cylinders, fixed horizontally, with double-acting pumps directly connected with the piston rods. At first a simple plunger pump at each end of the cylinder was used; then, with a view to greater compactness, the pump behind the cylinder was discontinued, and the other made a double-acting one, upon the combined bucket and plunger system. Finally, a modification was adopted of that form of pump by dispensing with the clack in the bucket, and substituting an external delivery valve. It is right to observe, that this neat modification of the bucket and plunger principle, by which equally easy access is given both to the suctional and the delivery valves, was the suggestion of Mr. Henry Thompson, Mr. Armstrong's late intelligent foreman.

It is not deemed requisite to amplify further upon that branch of the subject which embraces the two important principles of *accumulation* and *transmission* of power, by means of which a steam engine can be economically applied to give safe and rapid motion to a multiplicity of machines intermittent in their action and distant from each other. But it remains to notice the applications made by Mr. Armstrong of the pressure derived from natural falls.

When the moving power consists of a natural column of water the pressure rarely exceeds 250 or 300 feet, and in such cases he has employed for rotative action (in preference to his original scheme of a rotatory engine) a pair of cylinders and pistons with slide valves resembling in some degree those of a high-pressure engine, but having relief valves to prevent a shock at the return of the stroke.

The water-pressure engines erected by Mr. Armstrong at Mr. Beaumont's lead mines, at Allenheads, in Northumberland, present examples of such engines applied to natural falls. They were there introduced under the advice of Mr. Sopwith, and are now used for the various purposes of crushing ore, raising materials from the mines, pumping water, giving motion to machinery for washing and separating ore, and for driving a saw-mill and the machinery of a workshop. In all these cases nature, assisted by art, has provided the power. Small streams of water, which flowed down the steep slopes of the adjoining hills, have been collected into reservoirs at elevations of about 200 feet, and from these pipes have been laid to the sites occupied by the engines.

Another application of hydraulic machinery, in connection with Mr. Beaumont's mines, is now being made in situations where falls of sufficient altitude for working such engines cannot be obtained, and this, from its novelty, deserves a special notice in this paper. For the purpose of draining an extensive mining district, and searching for new veins, a drift or level nearly six miles in length is now being executed. This drift runs beneath the valley of the Allen, nearly in the line of that river, and upon its course three mining establishments are being formed. At each of these, power is required for the various purposes that have been enumerated, and the problem arose how to obtain this power without resorting to steam engines. The river Allen was the only resource, but its descent was not sufficiently rapid to permit of its being advantageously applied to water-pressure engines. On the other hand, it abounded with falls suitable for overshot wheels, but these could not be applied at the points where the power was wanted. Under these circumstances, it was determined to make the stream operate, through the medium of overshot wheels, in forcing water into accumulators, and thus generating a power capable of being transmitted by pipes to the numerous points where its agency was required. In this arrangement intensity of pressure takes the place of magnitude of volume, and the power originating from the stream assumes a form susceptible of unlimited distribution and division, and capable of being utilised by small and compact machines.

Something of the same kind is also being

applied at Portland Harbour, in connection with the coaling establishment there forming for the use of the Royal Navy. The object in that case is to provide power for working hydraulic cranes and hauling machines, and more particularly for giving motion to machinery arranged by Mr. Coode, the present engineer of the work, for putting coal into war steamers. A reservoir on the adjoining height affords an available head of upwards of 300 feet, but, in order to diminish the size of the pipes, cylinders, and valves connected with the hydraulic machinery, and also with a view of obtaining greater rapidity of action, it has been deemed advisable to interpose an hydraulic pumping engine and accumulator for the purpose of intensifying the pressure, and diminishing the volume of water acting as the medium of transmission.

Mr. Fairbairn said the country generally was indebted to Mr. Armstrong for a power that it was always difficult to attain, particularly in the movement of water. He remembered himself, about twenty years ago, constructing a water engine for pumping; but the great difficulty he had to contend with was the incompressibility of the water, and they were under the necessity of admitting air into the plunger in order to make it anything like safe. Now, these regulating valves of Mr. Armstrong's were so ingeniously contrived and well adapted for the purpose, that he thought they had now attained a great and important desideratum in the construction of hydraulic machines. There was only one thing he should like to ask Mr. Armstrong; and that was, the comparative value of these machines, when steam could be applied for the same purpose. He wanted to know whether the application directly of the steam engine would not be preferable to that of water. It was very important that the commercial value of this very ingenious contrivance should be known.

Mr. Anderson, of the Royal Arsenal, Woolwich, said there were two points which Mr. Armstrong had omitted to mention. The first objection was the liability to freeze in the winter season. Now, he had had some of these cranes under his charge during the last two or three years, and he had not had the slightest difficulty in that respect, as a single jet of gas burning was sufficient to prevent any freezing. There was another very little arrangement in connection with them upon which he thought the great success of this arrangement depended, and that was the joints of the pipes. He remarked upon the great economy that attended the working of these engines; he did not speak of economy as compared with steam, but a real economy in performing a large amount of work in a short time, and with a small amount of labour. Hydraulic machines, embracing ten cranes, had been erected in the arsenal at a cost, for foundation and everything, of £30,000, during the Crimean war. The ships that went out were loaded in the river, and each ship required three weeks to load, whereas, when the vessels returned the cranes were completed, and such was the celerity with which they were emptied by means of the cranes, that the saving effected in six or eight weeks covered the expense of erecting the cranes.*

Mr. T. E. Harrison said he had used these cranes extensively, and they might be seen at work at the Central Station in Newcastle, where they were used for the purpose of turn-tables, lifting coke, &c. Comparing water with steam power, it was also more economical. He had had considerable experience in the working of both, and, having considered the question of relative economy, he had determined upon doing away with the cranes worked by steam power in the goods warehouses, and applying hydraulic machinery. At the same time, the convenience and expedition resulting from the use of hydraulic machinery were so great, that the simple question of pounds, shillings, and pence was quite overweighed.

Mr. Armstrong, adverting to the observations of Mr. Fairbairn, observed that the usefulness of the hydraulic principle of working depended, in the great majority of cases, upon the principle it involved of transmitting the power generated by the steam engine, and rendering it applicable under circumstances in which it could not otherwise be used at all. Taking the case of the Victoria Docks, the area over which the power there was required to be distributed involved pipes nearly four miles in length. Of course it would be impossible to have steam engines at all points. They could not have steam engines in warehouses; they could not spare the room or risk the danger of fire; but, by this principle, they could produce the power by a single steam engine, and, having produced it, they could apply it where it was wanted in the most unobjectionable and most manageable form. This gave them the advantages of steam power in cases where they could not otherwise have it all, because there were no other arrangements by which power could be transmitted to great distances and practically applied. The day had not arrived for properly appreciating natural waterfalls, which were generally in places difficult of access, and appeared of very little value; but, as population, roads, and railways extended, and as all localities became

* See *Mechanics' Magazine*, vol. 66, p. 127.

valuable for manufacturing and other purposes, the day would come when the natural falls, yielding great quantities of water, at a great height, and where water could be accumulated on the plateaus of hills, would become most valuable for manufacturing purposes, and where the power naturally afforded would be used immensely in preference to steam engines.

Mr. FAIRBAIRN stated that in Manchester there was a great number of warehouses with hoists which were worked by a high-pressure engine. Looking at the frequency of boiler explosions, and loss of life from that cause, he thought the hydraulic principle would be a great boon, and he should be happy to use his influence to introduce such an excellent and useful kind of machinery.

THE BRITISH ASSOCIATION.

THE twenty-eighth annual meeting of this Association commenced at Leeds on the 22nd ult., under the presidency of Professor Owen, who delivered a very able discourse upon the occasion, in which he, with much ability, suggested that in the progress of the Association we seem to be realizing the grand Philosophical Dream or Prefigurative Vision of Francis Bacon, which he has recounted in his "New Atlantis." In this noble Parable the Father of Modern Science imagines an Institution which he calls "Solomon's House," and informs us by the mouth of one of its members, that "The end of its Foundation is the Knowledge of Causes and Secret Motions of Things; and enlarging of the bounds of Human Empire to the effecting of all things possible." As one important means of effecting the great aims of Bacon's "six days' college," certain of its members were deputed, as "merchants of light," to make "circuits or visits of divers principal cities of the kingdom." This latter feature of the Baconian organization is the chief characteristic of the "British Association;" but its supporters have striven to carry out other aims of the "New Atlantis," such as the systematic summaries of the results of different branches of science, of which the published volumes of "Reports" are evidence; and have likewise realized, in some measure, the idea of the "Mathematical House" in the establishment at Kew.

We already have in type as many of the papers which were subsequently read as we can afford space for this week, and must therefore defer further notice of the learned Professor's comprehensive address. The papers alluded to, with others that are to follow, will appear with the words "British Association, 1858," appended in a foot-note, in conformity with our usual practice.

Prince Albert has consented (conditionally) to preside at the next annual meeting of the Association.

ON THE PROGRESS OF MECHANICAL SCIENCE.

BY W. FAIRBAIRN, ESQ., C.E., ETC.*

IN opening the business of the section,† I have to congratulate you upon the encouraging prospects which our meeting in this great mart of industry is calculated to afford. This large and important district is only just recovering from a state of intense excitement and a burst of loyalty that has reverberated from one extremity of the Riding to the other. In these rejoicings I have naturally taken a deep interest, and, now that the royal visit is over, a meeting for the extension of science and useful art is probably the most appropriate conclusion of the festivities which have occupied the attention of this town for the last two weeks.

On a former occasion when I had the honour of occupying this chair, I endeavoured to combine in a condensed form such improvements in mechanical science as had been effected during the successive intervals between the annual meetings of this Association; and, conceiving that a short account of what has taken place during the laast few years may not be unacceptable, I have on this, as on previous occasions, ventured to direct your attention to a succinct retrospect of what I consider new and valuable in mechanical art.

In mechanical science and general engineering this country continues to maintain its high position in new developments and continued progress, and the almost innumerable patents weekly taken out under the new law are remarkable indications of the activity and inventive powers of this country. It is not yet thirty years since the introduction of malleable iron as a material for shipbuilding took place, and

* British Association, 1858.
† The Mechanical Section.

a much shorter time has elapsed since it was first applied to the construction of bridges. We have all of us heard of the tubular system so successfully applied to the bridges across the Conway and Menai Straits. Now it is extensively employed in every quarter of the globe, and there is no span within the limit of one thousand feet but which might be compassed by the hollow-girder bridge with security and effect. These discoveries are of immense importance to mankind, and where they are carried out with skill and a strict adherence to sound principles of economy and science they give to the engineer of the present day a power which in former times it was impossible to realize.

STEAM NAVIGATION.

In this department of practical science, although much has been done, yet much remains to be accomplished in giving to the iron ship uniformity of strength and security of construction. In vessels of such complex form, bounded by such a variety of curved surfaces, we are yet much at sea as to the precise points of application of the material in order to attain the maximum of strength combined with lightness and economy in the distribution of the material. These are data yet to be ascertained, and it will require long and laborious experimental researches before the facts are clearly known and established. Much has, however, been accomplished in the absence of these data, and I may safely refer to that noble structure the *Leviathan*, which, with all her misfortunes, is, nevertheless, a most magnificent specimen of naval architecture. The cellular system, so judiciously introduced by Mr. Brunel, is her great source of strength, and I am persuaded that she will stand the test (which I have recommended in other cases) of being suspended upon the two extreme points of stem and stern with all her machinery on board; or, these conditions being reversed, I believe she may be poised upon a point in the middle, like a scale beam, without fracture or injury to the material of which she is composed. Her cellular construction and double sheathing round the hull, and the same formation on the upper deck, give to the vessel enormous power of resistance, and her division and subdivision by bulkheads ensure a large margin of security in whatever circumstances she may be placed. In fact, she may be considered as a large hollow girder requiring a load of nearly 10,000 tons suspended from the centre to break her. I mention this to show that her want of success is not due to any fault in the ship herself, but to the magnitude of the speculation as a commercial transaction, and her unmanageable character in regard to the shipment of cargo, and similar difficulties which she may be called upon to encounter. I hope, however, that the necessary funds will be forthcoming to complete her equipment, and that we shall yet see her dashing aside the surge of the Atlantic at a speed of 18 to 20 knots an hour.

RAILWAYS.

The magnitude of this great republic (as it is called) of speculation and industry is scarcely, if ever, appreciated by the public. We look at the locomotive of the present day, or glide by its means over the surface of the earth, without once thinking of the amount of skill and capital expended in the production of such vast and important results. At the present moment we learn from returns recently published, that we have in this country alone 9,500 miles of railway executed and in actual operation, and taking, at a rough calculation, one locomotive engine with a force of 200 horses power to every three miles of railway, and assuming each to run 120 miles a day, we thence calculate the distance travelled over by railway trains to be equal to 380,000 miles per diem, or the enormous distance of 138 millions of miles per annum, a space measuring the distance of the planets, and beyond the conception of those unacquainted with figures. To transport engines and trains this distance requires a force equivalent to that of upwards of 200,000 horses in constant operation throughout the year.

As regards the commercial value of railways, it will not be necessary to enlarge upon it in this place; suffice it to observe that a clear revenue of twelve millions is left after all expenses are paid, for distribution amongst shareholders and creditors. This amounts to three and three-quarters per cent. per annum, a small return upon 320 millions, the original cost of 9,500 miles of railway on an average of £34,000 per mile.

In the locomotive engine there has been no improvement of importance during the last two years, excepting only its adaptation to burning coal instead of coke without the production of smoke; to a certain extent this has been successfully accomplished, but the process is still far from perfect. Superior training is wanted for engineers and stokers before we can look forward with certainty to the time when the use of coal will become general, with increased economy and with the suppression of the nuisance of smoke.

In the formation of the permanent way considerable improvements have been effected, especially in the joining of the

rails by what is technically termed the fish joint, which secures a more perfect union of the rails, produces a smoother surface, and diminishes the wear and tear of the rolling stock, when compared with the old system of joining, so sensibly felt in carriages running over the line at great velocities.

MANUFACTURES.

For the last twelve months great depression has existed in this department of the national industry, and, notwithstanding the attempts to cheapen the production of the staple articles of manufacture by the introduction of improved machinery, there still exists a considerable depression in many of the great marts of industry. This is probably to be attributed to the disturbed state of India and China; but, looking at the native activity of the manufacturing population and the amount of capital employed, there has been no serious diminution in the production of manufactured articles, nor any stagnation in the demand for labour. On the contrary, I believe, with the exception of the causes just alluded to, that the manufactures of this country generally were never in a more flourishing condition.

In the iron trade, with which this section is more immediately connected, there has been a similar but slight depression, the manufacture of pigs, plates, and bars being as great as in any former year; and, taking into account the improved process by which malleable iron and steel are now produced, there is reason to hope for a greatly increased demand and an enlarged production. In fact, such have been the improvements since Mr. Bessemer first announced his new process of boiling the crude iron direct from the smelting surface and dispensing with the puddling process, that we appear to be now in a state of transition from the old system of smelting, refining, and puddling, to a more direct, continuous, and improved process of manufacture.

Steel bars and plates are now made without the intervention of an intermediate and tedious process, and we may reasonably look forward to the introduction of an entirely new article of manufacture of greatly increased powers of resistance to strain. Although hitherto Mr. Bessemer has not succeeded in producing malleable iron by his new process, he has made beautiful refined iron, and has stimulated others to attempts at improvement in the same direction. His discoveries first given to the world through this section have already proved of great value to the community, and we look forward with confidence to the introduction of still greater improvements—improvements by which steel plates and bars will be produced at almost the same price as we can now obtain the best manufactured iron at.

THE MACHINERY OF AGRICULTURE.

This is a branch of mechanical arts which requires the careful consideration of the mechanician and the engineer. The time appears to have arrived when the introduction of machinery combined with the wide diffusion of education is absolutely required amongst our agricultural population; and in my opinion increased intelligence, together with new machinery, will double the production of the soil and improve the climate in which we live. Much has already been done, yet very much is yet to be accomplished; we must persevere in the new process of deep draining and subsoil ploughing, and in the substitution of steam power in place of horse and manual labour, before we can realize such large and important advantages as are now before us. Great changes and improvements have been effected in my own time by the introduction of new implements to relieve the labours of the farm. Everything cannot, however, be done by the mechanician and engineer; much has to be done by the farmer in the preparation of the land to render it suitable for machine culture, and a willing heart as well as a steady hand is required of the agriculturist before he can work for the public good in concert with the engineer. The reaping machine has now attained such a degree of perfection as to bring it into general use on lands prepared for its reception, and the steam plough is making rapid strides towards perfection, and is likely to take the place of horses, and effect a change as beneficial to the farmer as it will be advantageous to the public at large.

ELECTRIC TELEGRAPHS.

The consummation of telegraphic communication between the Old and New Worlds is the crowning triumph of the age, and I hail in common with every lover of science the immense benefits which the successful laying of the Atlantic cable is calculated to secure for mankind. It is another step forwards in the great march of civilization, and the time is not far distant when we shall see individuals as well as nations united in social intercourse through the medium of the slender wire and the electric current. These are blessings which the most sanguine philosophers of the past never dreamt of; they are the realizations of the age in which we live, and I have to congratulate the section on what has already been done in the wide, and to some extent unexplored, field of this wonderful discovery.

ON THE GRESHAM BUOY FOR RECORDING THE LOSS OF SHIPS AT SEA.

BY J. OLDHAM, M.I.C.E., OF HULL.*

In an enterprising, commercial, and maritime country like Great Britain, with its tens of thousands of ships of every class and description navigating in all directions and in every latitude the great highway of nations, encountering the storms and risking the rocks and shoals of every navigable part of the globe, it is not surprising that losses and disasters should occur. Few, however, will be prepared to hear that, during the last fifteen years, ending with 1857, there were wrecked, burnt, or missing 8,998 sailing vessels and 175 steam vessels, giving a total of 9,173, and also a total of 1,805,367 tons = 120,357 tons per annum, and showing an average of upwards of 196 tons for each ship, and an average also of upwards of 611 ships per annum. It may not be out of place here to refer to the ships of the British Royal Navy, and also to the total number in the mercantile navy. The British Royal Navy in 1857 consisted of 862 ships of all classes and kinds, and there are amongst them 470 mounting 15,885 guns, varying according to the ship from 1 to 131 guns; and there are 156 gun-boats (say 2 guns each) with 312, making a total of armed ships of 626, and a total of 16,197 guns. The remaining 236 vessels consist of troop ships, despatch boats, lighters, receiving ships, store ships, &c. Such a navy requires no comment from me, but is able to speak for itself. If the Royal Navy, however, exhibits so noble a front, I think the mercantile navy is equally to be admired, for during 1857 there were British registered vessels 37,014, having a tonnage of 5,519,154, giving an average of upwards of 149 tons to each vessel.

The immediate object of this paper is to point out a mode by which a record of the loss of a ship at sea may be attempted where otherwise no account would ever be obtained. It has long been a matter of deep concern and anxious thought to many, to devise some plan by which the total loss of ships and all they contained might have a chance of being made known to the world. Numbers of noble ships containing valuable cargoes and multitudes of precious lives have sunk into the depths of the ocean, and not a fragment discovered as a memorial of such sad events, thereby leaving us in the dark as to the locality or the immediate cause of the catastrophe.

To remedy, in some measure, the dreadful suspense into which multitudes are thrown by such dire events, and to furnish, it may be, the mournful satisfaction to surviving friends and others interested in such calamities by knowing the last that befel the fated ship, a benevolent gentleman of my neighbourhood, John Gresham, Esq., J.P., Alderman of Hull, suggested an idea which he has commissioned me to communicate to the British Association, and if, by his plan, a record of losses at sea may be made, giving a more certain chance at some time or other of their becoming known, he will feel himself amply repaid for any thought he may have devoted to the subject. Having taken Mr. Gresham's suggestion into consideration, I have to state, that he proposes that every sea-going ship, of whatever description, and particularly those carrying passengers, shall be provided with one or more copper buoys, bearing the name of the vessel, and the port or place to which she belongs; that they shall also have an Admiralty mark and a Board of Trade number, so that, even if only the number were found upon it, it would be known to what ship or vessel it had belonged, supposing it contained no record within it. The Gresham Record Buoy (for that, I think, would be a good name by which to designate it) would be provided with a chamber and small spring valve in the upper part, made to open outwards, and capable of resisting any ordinary pressure. Within this hollow space or chamber it is proposed to insert a slip of paper or card, or any other document, and even property if made large enough, when all hope of safety and rescue shall fail, and, at the final sinking or breaking up of the ship, the buoy would float off with the probability of being picked up at some time. The Record Buoy is intended to be made of strong copper of sufficient size to be applicable to the purpose, painted in bright red and white stripes, and fitted with a small bell and flag on the upper part. There are several advantages to be derived from the use of this buoy, and, amongst others, three of importance—viz., firstly, the mournful satisfaction to surviving friends and relations of being informed of what has befallen the ship and crew; secondly, satisfaction to insurance companies and the insured, that the ship and cargo are really and for ever lost; and thirdly, the light which may be thrown on science, as such records would probably explain the cause of accidents and the circumstances attending them; for instance, whether owing to the build and want of strength in the ship, failure in machinery (in case of a steam vessel), or having struck on an iceberg or stranded on a rock. In case also of imminent danger

* British Association, 1858.

to a ship, these or similar buoys might be set afloat with the chance of being picked up, containing a description of their situation and danger, thereby giving a chance of relief. Allusion has been made to glass bottles which have been used in several instances communicating loss, and the scheme before us is the same in principle, but having advantages which cannot be possessed in bottles, both as to efficiency, and marking, and numbering; and, while glass bottles would be broken by the contact of rocks and other hard substances, the buoy in question would bear a considerable amount of rough usage before it would be entirely destroyed. A reward should be offered to any one finding the buoys and at once reporting the same. The author of this paper is greatly indebted to Captain Brown, R.M., Registrar-General of Mercantile Shipping, for many important statistics.

THE ECONOMY OF WATER POWER.

BY JOSEPH GLYNN, F.R.S., M.I.C.E.*

THE turbine requires considerable skill in its construction, and careful attention when it is in use; but the horizontal water-wheel is a much more simple machine and much less liable to derangement. It is not a costly machine, and it requires comparatively little care.

These horizontal wheels are much alike in principle and in plan, although they may and do differ from each other in their details, and they also differ materially from the vortex wheels which Mr. James Thompson well described in an excellent paper read before the British Association in Belfast, which may be compared with that of Appold's pump with its action reversed. The water drives round a fan with curved vanes having a vertical axis and revolving in an iron case, the water escaping at the centre.

The horizontal water-wheels in the French Exhibition were much alike in principle and in plan, although they might differ from each other in their details. They generally consisted of two parts or wheels placed horizontally on a vertical axis, one wheel immediately above the other. The upper part or wheel is fixed, and serves to direct the water into the buckets of the lower one, that is to say, the real water-wheel, which revolves, and the axle or spindle revolves with it.

If the fall or head of water be but little and the quantity of water large, the machine is generally fixed in masonry; but, if the fall be great and the quantity small, it is generally fixed in an iron cylinder, sometimes closed at the top; the water being then brought into the side by an inclined pipe descending from the elevated sources of the water. The regulators which determine the quantity of water and the speed of the wheel may vary in almost every instance; some being mere wooden sluices, some metal plates pierced with apertures like a ventilator, and some of stout leather strengthened with iron plates, the leather being in three pieces and fitted upon conical rollers radiating from the axis. Some of these wheels are very powerful and carry a spur which passes the vertical axis, surrounded by six pairs of millstones for grinding corn, driven in the usual way; other wheels of smaller size and greater speed drive a single pair of millstones without the intervention of other mechanism; the axis of the water-wheel being also the spindle of the millstone.

The mechanical effect of these machines, when carefully made, is said to equal that of an overshot or breast wheel. Messrs. Frowort state that some of their making realize 75 per cent. It is somewhat singular that these wheels, which some of our engineers and millwrights now make for exportation, should not be used at home. The well-known firm of Bryan, Denkin, and Co., of London, may be mentioned as the principal makers and exporters of the horizontal wheel.

The writer has been induced to submit to the Section the waste of water power in so many places where it may be turned to profit from his having recently visited some of the undulating and hilly counties bordering on Wales, where almost every valley has its stream or brook ready to do good service, and the means of making such power available at moderate cost.

* British Association, 1858.

ON AN APPARATUS FOR EXHIBITING OPTICAL ILLUSIONS ILLUSTRATING SPECTRAL PHENOMENA.

BY H. DIRCKS.*

SIR DAVID BREWSTER has judiciously remarked that, "although it is not probable that we shall ever be able to understand the actual manner in which a person of sound mind beholds spectral apparitions in the broad light of day, yet we may arrive at such a degree of knowledge on the subject as to satisfy rational curiosity and to strip the phenomena of every attribute of the marvellous." I cannot say of the work in question that the many ingenious illustrations given as the result

* British Association, 1858.

of natural phenomena or scientific combinations lead to the anticipated result, for in every instance adduced the aerial or spectral figures are but isolated visions, or, when produced artificially, are of very limited application.

The peculiar features of the optical arrangement I introduce may be thus stated: Two or more figures, for example, appear on a stage, and the spectators view them as two living actors, in all respects the one as well defined and obviously round and life-like as the other, yet one shall be a material and the other only a visionary actor, results obtained in a manner by no means in accordance with the before named views expressed by Sir David Brewster. We may suppose a theatre or apartment, arranged as customary when required for dioramic exhibitions, a stage being provided and the spectators placed in a distant, darkened, and elevated portion of the building. The spectators, thus situated, may, for example, see on an illuminated stage two or more figures, but without being aware that one or more of them bears a visionary character. The peculiarity of this mode of exhibiting spectral appearances, it will be understood, consists in thus associating a living or solid figure with a merely visionary one, and yet the illusion to be so well sustained that the spectator distinguishes no visible difference between the several actors when properly managed until the circumstances of the dramatic scene require the visionary figure to fade away or pass through the furniture and walls of the apartment, or play any similar spectral part.

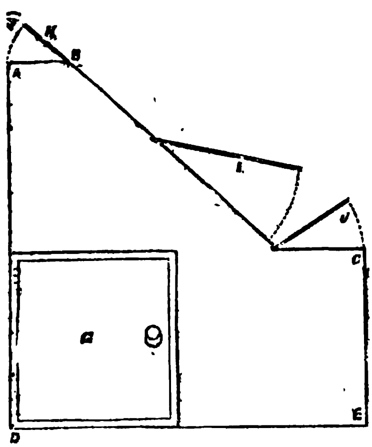
It is more than twenty years since I first invented a plane mirror of unsilvered glass, but, finding no practical utility in the contrivance, it was laid aside. It happened, however, that within the last two years I accidentally observed a solid body in a peculiar situation, by which it was apparently rendered transparent. It was, in short, an effect illustrated by my plane unsilvered glass mirror in its principle. I immediately saw that by means of this combination the singular appearance could be produced, of getting behind a mirror and communicating with its shadows. Here, then, a means was at once at hand for producing the best possible illustrations of all descriptions of spectral phenomena. For this purpose I arranged an oblong chamber into two equal portions, making the separation between the two by means of one vertical screen of thin glass, having a perfectly true surface. We may suppose each chamber to measure twelve feet square and twelve feet high. Now, let one of these be the stage in which the acting is to take place, its floor and three of its walls are solid, and the fourth or front of it is one entire glass screen; the ceiling must be made to open at different parts to let in light, and have suitable blinds to regulate the light and shade in which the actors perform. The chamber opposite, or facing the actors, is in reality a second stage for carrying out the spectral performances, and is differently constructed; the two sides may be large folding or sliding doors, or may be left quite open, or one side closed and the other open, but the ceiling must cover only that half of the top away from the glass screen or partition, thus leaving an open space in the ceiling of six feet by twelve feet. Through this space so left in the ceiling the spectators obtain a full view of the stage, their seats being above the half ceiling described, and thrown rather backwards than forwards; the line of vision thus being at an angle of about forty-five degrees with respect to the vertical glass screen or plane unsilvered crystal mirror. It will now be obvious that the actor on the stage beneath the seats of the spectators can only be seen by reflexion, and the trained actor in the opposite stage, knowing the precise situations of the reflexion as seen by the spectators, performs accordingly, so that, when really seeming to stand confronting the vision, the actor whose reflexion is thus seen as a vision is as far from the screen on one side as his reflexion is cast in the other.

Some striking effects may be produced illustrative of the illusive properties of optical apparatus constructed on the principle described. Thus, a figure placed before a white screen is so strongly reflected that the spectator cannot divest his mind of there being the substance and not the shadow which he observes, particularly as he contrasts them with an adjacent solid figure. By placing two figures of corresponding form equidistant, one on each side of the glass mirror or screen, they appear as one, until one is moved; and if they differ in colour, as one blue and one white, the effect seems more remarkable. If a cabinet, box, or the like is placed one on each side of the mirror until the image of one exactly corresponds with the material figure of the other, then the spectator may see the visionary figure open a drawer or door and remove and replace anything therein, and afterwards the solid figure repeat the same acts. If the reflexion of an actor is thrown on a transparent screen it is invisible, but by gradually decreasing the light the spectral appearance will be as gradually developed, until apparently it becomes a firm, solid figure in all its proper costume, and acting in perfect conformity to its designed character.

The arrangement of the apparatus is

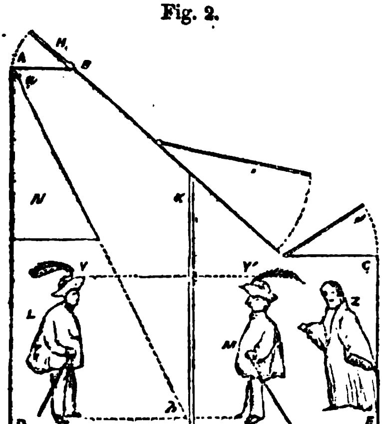
represented by the annexed engravings. Fig. 1 is a side elevation, fig. 2 a vertical section, and fig. 3 a plan. A B C D E is a box closed on all sides, but provided on

Fig. 1.



one side with the door F, and on the other with the door G, hinged to the back, A D; and on the top of the box are the flapped openings H, I, J. The interior of the box is divided centrally by the partition K K, made of a good, clear, and even-surfaced piece of thin patent plate glass, kept in its place within two side grooves. The box is thereby divided into

Fig. 2.

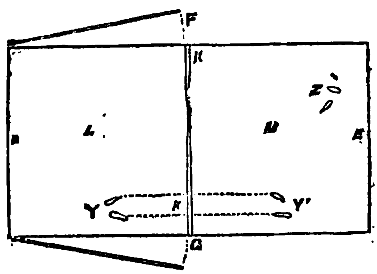


two separate chambers or compartments, L, M, the latter, M, having a ceiling or screen, N, to exclude any object therein from the direct view of the spectator, as shown by the line *a b*.

If two figures be now introduced, one Y, the other Z, and the eye of the spectator be fixed at A, he will observe two images, one the real figure Z, the other Y′, the mere reflection of Y. By this arrangement it is evident that the plain unsilvered glass thus viewed at an angle of about 45° has all the properties of a mirror, but, owing to its transparency, two figures are seen possessing little or no distinguishable difference between them. Of course a person placed at Z sees only the figure Y; but as a piece of acting he may, under proper arrangements of a suitable stage, approach the situation apparently occupied by Y′, and thus indicate to spectators placed at A any pre-arranged dramatic scene requiring Z to be in correspondence with the visionary figure Y′.

In using the apparatus, the flap H must be open, but I may be shut, being mostly useful to get admission for inserting or withdrawing the screen or the figures. The flap J may be closed or opened to

Fig. 3.



regulate the admission or exclusion of light. The two doors, F, G, may both be wide open, though one is generally sufficient, provided it is turned as direct as possible to thelight. A mirror placed at an angle close to the opening F or G will assist the illusion by illuminating the figure Y, and thus heightening the effect of the reflection Y′.

If two geometrically proportionate figures, as spheres, cubes, or the like, be placed in the situations Y, Y′, then the image at Y′ will be a vision and a substance combined, as will at once appear by slightly moving the substantial body in either compartment, L or M. Let the duplicate figure be a box, and then the spectator might observe the apparent anomaly of the same box being opened and a substance taken from it and replaced either by a substantial or a visionary actor. When the compartment M is lighted up no vision appears, but, the light being made gradually to fade and disappear, the vision might seem life-like, as at first. As it is evident that the right hand of the vision is the left hand of the actor in the compartment L, all his acts requiring the right

would have to be performed with the left hand, to appear natural to the spectator. It is also requisite for ensuring a good effect that no solid figure in the compartment M should come before or behind the visionary image, as its transparency would at once become evident; but, if anything of the kind is desired, then the background figure or object should be placed behind the actor Y, and become with him also visionary. In this way a white screen placed behind the actor Y will allow his shadow to appear on it, and give great force and solidity to his reflected figure or vision at Y′.

THE ATLANTIC TELEGRAPH.

The morning papers of Tuesday last contain a communication from a correspondent at Valentia on the Atlantic cable. He states that operations there have not been extended, everything remaining in *statu quo*. The fault does not, he says, get worse at any time, but sometimes it improves. The opinion that the chief fault is near the shore is gaining ground there. A defect very similar to the present occurred, he states, a short time ago in one of the North Sea cables. Mr. C. F. Varley and others examined the cable and pronounced the fault to be 170 miles off. After cutting the cable and wasting much time, the faulty place was found buried in the beach. The Cork steamer, which arrived at Valentia on Monday last, took Mr. Henley's gigantic magneto-electric machines, which were got into operation on the following day. These machines are slight modifications of the magneto-electric machines which in place of batteries are used for working over all the telegraph lines in Ireland, though, of course, on a gigantic scale, being the most powerful instruments of the kind yet constructed. The two permanent magnets, from which the electric induction is obtained, are each composed of thirty horse-shoe steel magnets two feet and a-half long and from four to five inches broad. The induction coils attached to these each contain about six miles of wire. With their aid Mr. Henley hopes to be able to work through the cable during some part of each day, even if the fault should prove irreparable, the smaller instruments of the same kind having been found to work better over badly insulated lines than any other instruments. This correspondent further states, that a variety of experiments have been tried lately, both by Professor Thomson and Mr. Henley, to discover the relative power of different electrical currents to pass a fault. For this purpose the wire connected with the cable was stripped of its gutta percha covering in one place and the fault immersed in water. The relative amount of electricity which passed by the fault into the cable was accurately measured by a delicate galvanometer. It was found that a current of electricity direct from the battery cells was hardly perceptibly reduced in quantity after passing by a break in the insulation an eighth of an inch long; the induced current from Mr. Henley's magneto-electric machine was slightly interrupted in passing the same fault, but the high tension induced coil currents, which have been used from the first in sending messages from both sides of the ocean, were found to be almost entirely stopped by it. These experiments, besides showing the kind of electricity best adapted for working through the cable in its present defective state, also show most conclusively that one defect in the insulation, however great, would not be sufficient to interrupt the communication; so that there must be several faulty places in the line. That some, if not the majority, of these places are close to the land there can be very little doubt. The soundings from Valentia for about 60 miles to sea show a rocky and irregular bottom, which, indeed, the precipitous cliffs which line the coast, and the numerous lofty islands which surround it in all directions, would show without the use of the sea lead. Over these submarine hills and valleys a very strong current sweeps, to resist which it would require a cable at least three times as thick as the one now in use. The small piece of the Atlantic cable which connects Valentia Island with the mainland (about a mile) is repeatedly being cut and injured by the tide drifting it across the rocky bottom, and it is quite possible to suppose that the rapid current outwards from the broad estuary of Dingle Bay may have the same effect upon the thin Atlantic cable which runs across its mouth. It is the unanimous opinion of nearly all at Valentia that the laying of ten or twelve miles of the thick shore end of the cable would tend permanently to obviate a great many of the difficulties with which the electrical department of this undertaking has been hitherto interrupted.

In reply to the allegations contained in the communication above referred to, Mr. Varley states that his means of testing are not wholly dependent upon the resistance offered by the cable, and that he searched diligently for indications of a fault nearer shore, but without success. His estimated distances are seldom more than five per cent. in error, and then only in cases of difficulty. In answer to the assertion respecting the North Sea cable, wherein he is stated to have estimated the fault at 170

miles distance, "I need only inform you," he says, "that the longest wire is but 125 miles in length." While testing the Atlantic cable he adopted four distinct modes.

To the Editors of the Mechanics' Magazine.

GENTLEMEN,—It is much to be regretted, but more for their own sake than for the cause of the progress of international relations, which will only be temporarily retarded, that the Atlantic Telegraph Company should have adopted the policy of secrecy in regard to the details of their operations, and particularly in respect to the electrical results obtained, when they had the opportunity at Keyham of experimenting at their leisure through the entire length of the cable. It only came out incidentally, and exclusively I believe through your own pages, that the rapidity of communication was limited to twenty currents, or less than one word per minute, although it was permitted to be understood that four words could be sent in a minute. Such a result, it now appears, was only effected by the use of conventional signs. Had the real electrical condition of the cable been authoritatively announced, and the opinions of experts in telegraphy elicited, there cannot be a doubt that the Company would have been advised to sell their cable, which for much shorter distances would have answered very well. The fact is, that too much of a pushing, inconsiderate, business energy was imported into the undertaking, and that the *go-ahead* spirit dominated, to the exclusion of indispensable preliminary experiments. Instead of there being one culpable scape-goat, all parties should take blame to themselves for being under such an influence; and I do hope you will permit me, in the interest of the welfare of the renewal of the undertaking, and with the exclusion of every other animus, to point out a few of the mistakes which have originated from this cause.

The main error, arising from making too great haste for good speed, and involving all the other electrical errors, consisted in omitting to put the cable under water when testing it for its soundness whilst in each manufacturer's yard, and again when testing it for its capabilities on the two portions being united in one length. The International Company make their cables pass through this ordeal, and it has been found that a fault has been made manifest in this manner after it has escaped detection in air. Had this plan been adopted, the fault, which is probably a very serious one, existing near the middle of the *Agamemnon* length of the cable, would not have been allowed to pass. It would have been discovered, also, that a mistake had been made in forming a too hasty conclusion from the single experiment on 2,000 miles of the Magnetic Company's lines. It would have been seen that the intense coil electricity, although well adapted to force a passage through a great length of subterranean wire, was very unsuitable for the inevitably greater and absolutely incurable leakage of a submarine wire; and that, in reference to this point, it not only wanted in compensating quantity, but would be suicidal in operation by turning small leaks into greater ones, and ultimately destroying insulation through a total destruction in those parts of the gutta-percha covering. It would have been noticed that electricity of such high tension would find avenues of escape where electricity of lower tension would pass quietly along. The experimentalists, surely, could not have failed also to have perceived that the attempt to overcome the resistance due to the great length of the conducting wire by the employment of intense force, although perfectly successful in its direct effect, was stultifying itself indirectly by its collateral issue, presented in the form of a static charge. They would have understood that such resistance would first originate and then augment the static charge in proportion to the increased tension given to the current to cope with a resistance that ought never to have arisen, at least to the degree of becoming an accumulating cause of evil; and they would have arrived, it were to be hoped, at the only wise and prudential conclusion, that it would be necessary to begin again with a new wire or wires, with a much greater conducting capacity.

It was unfortunate for the success of the Atlantic cable, that it was designed under the too exclusive influence of the magnetic school of telegraphists; but, had the water test been employed, they would most probably have discovered for themselves their error, and thus early have ascertained that the single experiment on which reliance had been placed was, in its bearing on an *Atlantic line,* at once a delusion and a snare. That error consists in the ultra-scientific idea of accomplishing an object by narrow means through a compensating intense coercing power, in place of the more natural method of enlarged appliances with a moderate force. I gave an illustration of this, though of another kind, in my last communication, in the case of Professor Thomson's centrifugal pump. The Atlantic telegraph will never be worked safely for any length of time, nor even be a usefully efficient one, except through the employment of a low and copious electrical force. This alone will meet the demand from inevitable leakage without making it worse, and at the same time afford a

sufficient surplus to produce a signal; and a future cable must be designed in accordance with this, as I regard it, practical fundamental principle.* Nor were the magnetists without warning on this head, for in 1854, nearly two years previously to their own experiment, experiments had been made by Mr. C. F. Varley on 1,500 miles of subterranean wire; from which he demonstrated, as fully as the subject admitted of demonstration, that an Atlantic telegraphic wire should not be less than one-eighth of an inch in diameter, nor have a less covering than what a gutta-percha rope of one inch in diameter would give, in order to be able to transmit ten words a minute. It is to this gentleman we are indebted that telegraphers are able usefully to work submarine lines at all, if of any considerable length, by introducing the expedient of employing a continuous current, and breaking it for a signal only by another continuous current of opposite electricity; thus by a process of mutual neutralization mitigating in a very considerable degree the retarding influence of a static charge, and also occupying the wire so completely by a direct battery current as to render it insensible to the interference of cross currents, or of any extraneous current from whatever cause. Apropos to this subject, I may also state, that I did myself mention, nearly four years since, but subsequently to Mr. Varley's invention, in a non-confidential correspondence on the subject of an Atlantic telegraph with Mr. Newall, the well-known manufacturer of electric cables, that opposite currents of electricity might be used alternately and severally for signals, but I perceive that this idea has now been recently patented by Mr. E. Bright.

As to mistakes in other departments of the undertaking, the principal one was in making the cable of too great specific gravity, occasioned by the omission, through being in too great a hurry, of making experiments on the rate of sinking of different specimens when in the different positions of the horizontal and the perpendicular, and the intervening ones between. By neglecting these important distinctions, Professor Airy's mathematical calculations became worse than useless. On account of the relative weight of the cable in water, a great excess was deposited, perforce, where it was not wanted; and where an abundant outlay would have been a prudential course, a scant measure was supplied; and it is in this locality that "the fault of great magnitude" is supposed to lie.

I make no apology for these animadversions, for a disclosure and a temperate discussion of errors is the proper path towards perfection.

I am, Gentlemen, yours, &c.,
BENJAMIN CHEVERTON.

[The above letter is inserted not because we agree with, or assent to, all that it contains—for we do not—but because it points, in several places, to undoubted and lamentable errors, which we most earnestly desire to see avoided in future Atlantic cables.—EDS. M. M.]

* Whether this is the secret ground of Mr. C. F. Varley's hope, that "it is not altogether impossible that some intelligible signals may yet be received through the cable," I cannot say, but in no other way can it be accomplished. I fear, however, that without raising the cable at the nearest fault nothing can be done; for Mr. Varley must have stated that the copper strand *does* touch the iron covering, and not, as you give it (quoting from his report as handed to you by the Secretary of the Company), that it is *not* in contact with it, for the proof that such is the case lies in the positive current that is evolved. Can it be that the cable has crossed a stream of hot water flowing from some submarine geyser, and that the gutta percha has melted?

GENTLEMEN,—If a cylindrical piece of gutta percha, less than three-quarters of an inch in diameter, be immersed in water, and subjected to hydrostatic pressure at the rate of rather more than two tons per square inch, will not the gutta percha gradually become saturated with the water to such an extent that no portion of its substance will be free from aqueous particles?

Does not such a piece of gutta percha fairly represent the whole of the provision made for insulating the electric wires of the Atlantic telegraph cable?

Is it not probable that some portions of the aforesaid cable lie at the depth of two miles from the surface of the ocean?

Is not the weight of water such that its pressure is equal to rather more than one ton per square inch for every mile of depth?

If these things are so, can the insulation of the present Atlantic telegraph cable be preserved?

I am, Gentlemen, yours, &c.,
J. PITTER.

17, Upper George-street, Greenwich,
Sept. 27, 1858.

WOOD EMBOSSING.—A newly invented process for so softening wood that it may be pressed into iron moulds, and receive permanent and sharp impressions in bas-relief, has, under the name of Xyloplasty, attracted much notice in Paris. The wood is softened by steam, and imbued with certain ingredients which impart to it sufficient ductility to enable it to receive bas-relief impressions from four to five millimetres in height.

TELEGRAPH CONDUCTORS.

GENTLEMEN,—Truly this is an age of wonders; every branch of science appears to be sprouting into luxuriant growth, and each unfolding blossom is instantly attacked by the busy bees eager to extract the hidden sweets, to add to the richness of their golden treasury. What a prolific branch is that whose vital agent is electricity; how rapid its growth, creeping and ramifying over the whole globe, and embracing within its tendrils the deepest interest both social and moral, and bearing fruits more precious than the vine! How ought we to appreciate the labours of its great cultivators! If we extol the genius of the agriculturist who makes two blades of grass grow where only one grew before, shall we not exalt still higher the men who, in the already fertile branch, can increase the vital energy of the sap, and accelerate circulation, and thereby induce more rapid and vigorous growth, crowned with a tenfold harvest of rich fruit? But let us inquire, is this the object of the labourers in the great field of electrical science, and are they using the correct means to that great end; or are they simply blundering on with nothing but the experience derived from the hit-or-miss rule of thumb philosophy of some of their predecessors? What great scientific law had the electricians who produced the Atlantic cable for their guidance when they fixed the tiny dimensions of their conductor? Did they consider that the great laws of electro-motive force and resistance, which have never yet been known to fail in their application to other conductors, would not apply to theirs because it was longer than had ever been made before, or had they no faith in their multiplication table, which teaches them that 5 times 1 are 5, and 6 times 1 are 6? Surely it would appear that no great amount of mathematical skill or logical reasoning would have been required to set out a formula which should express the value of any multiple of known elements. Possibly, however, their electrician, not having his mind encumbered with the results of the labours of others, or biassed by any of their deductions, may, in commencing his electrical pursuits, have started a theory of his own, and marked out a new line of investigation totally independent of all that had preceded him; and, having the pecuniary means as well as the trusting ear of the Company within his power, has preferred to work his way through the labyrinth of experiment, guided solely by the light of his own penetration. Whatever may have been his guiding star, it appears to have taken rather an erratic course, and, like another Will-o'-the-Wisp, has now disappeared, leaving him and his confiding followers to discover the quagmire into which they have been unwittingly led, and from which now, in the absence of their enterprising leader, they will have to retrace their steps in the best way they can.

The Atlantic cable has certainly furnished an example of how far it is possible to go in the wrong direction when people are too knowing to inquire the way. He must have an extraordinary penetration, great energy, and a capacious intellect who can grind himself up in electrical science in two short years to the task of undertaking such a gigantic scheme, and contriving all the appliances necessary for its successful completion. Time will doubtless bring to light some of the extraordinary productions of this self-educated genius, the colossal proportions and unique design of which will indicate unmistakably the comprehensive character of the brain that conceived them, and astonish the world by their perfect adaptation to the end for which they were designed; but why do geniuses of this class incur the unnecessary expense of obtaining Her Majesty's letters patent? They need not be under any apprehension that any of the common-place, hard-working, close-reasoning, and patiently observing philosophers by whom they are surrounded will pirate their schemes; they are of to osacred and sublime a character to come within the reach of their unsophisticated intellects, and would be perfectly safe in the most public keeping. Who, for instance, would dream of availing himself of the extraordinary production described in your late Number, as patented by a Mr. Chatterton, of the Gutta Percha Works, who, one would think, must be a disciple of the same great teacher, and who talks about diminishing the size of the wires in proportion to their length, so that as the currents become weaker they may have suitably sized conductors? Perhaps, in the course of his investigations, he may not have stumbled upon the fact, that the diminished size and extended length of the conductor are the causes which weaken the current, and that this weakness never ought to occur at all; or perhaps he was contented with consulting the great Western oracle, and following his direction, instead of travelling in the more beaten track of the wise men of the East. Extremes often meet, and perhaps these master minds have it in contemplation by turning their backs upon the present system of inductive philosophy, and following an opposite course, to prove that by rendering their conductors infinitesimally small, they will by and by obtain the same

results as others are now seeking to obtain on the other hand by increasing their dimensions. Time will, perhaps, show them that their course may be one of the exceptions to the rule.

I am, Gentlemen, yours, &c.,
A TELEGRAPH ENGINEER.

GENTLEMEN,—The inexplicable and unfortunate accident which has occurred to the electric cable, in a portion of it situated at a depth supposed to be too considerable for a successful attempt at its recovery and repair, urges me to present through your columns a few suggestions respecting the construction of a second Atlantic cord of communication, on the supposition that such will be requisite before long.

The scientific investigations of Maury, Berryman, and others, tell us that below certain limits animal life ceases, and that the surface of the telegraphic plateau is devoid of anything calculated to produce injury to a well-protected wire. I therefore infer that the outer metallic sheathing of the 1,200 miles of cable crossing the submarine table-land may be safely dispensed with as wholly needless in *that* portion of it, which I propose to construct as follows:—Take one solid wire of seven twisted strands, cover it with wool, hair, cotton, or silk, for better insulation, and to counteract the effects of induction; then follow with three-eighths gutta percha, which envelope in a coating of tarred spun yarn a quarter of an inch thick. From the flexibility and lightness of such a cable, it could be payed out by simple appliances like an ordinary rope, and if on the transit from the hold it was passed through a bath of melted tallow, the operation would be facilitated. I presume the vessel could steam at nine or ten knots in fair weather, and, should the small specific gravity of the cable prevent it from sinking to the bottom, an advantage would be gained in thus escaping from the influence of those electric currents which constantly traverse the earth's surface, and greatly disturb the magnetic equilibrium of the operating instruments. The 300 miles at either end of the cable to be of the same character as the one laid, to provide against abrasion from various causes, more particularly in the neighbourhood of the mountain ridge supposed to be the locale of the accident now deplored by the civilised world. A cable answering to the preceding description could be fabricated in a very short interval for less than half the expense of the original, and, if spliced at the distance of 300 miles from either shore to the intact portion of the one now submerged, might be laid across the Atlantic within eight days from commencement of operations, provided the weather was favourable.

I am, Gentlemen, yours, &c.,
P. FRANCE.

Sheffield, Sept. 21, 1858.

HOROLOGICAL IMPROVEMENTS.

THE following communication from Mr J. F. Cole, a very experienced horologist, who has spent many years in developing his improvements, relates mainly to a highly important modification of the escapement mechanism, whereby he is enabled to secure such a degree of perfection and security as has, we believe, never before been attained. We have had a watch of our own fitted with Mr. Cole's improvement, and have thus had ample ground afforded us for speaking in the highest terms of it.

To the Editors of the Mechanics' Magazine.

Gentlemen,—The circumstance of my having been called on by the Editor of the *British Horological Journal* to give a description of my improvement on the detached lever escapement for lever pocket watches and other timekeepers, together with your knowledge of the principle, from my provisional specification passing through your office, and your having the better means of judging of the practical value of the invention by your possession of a watch altered to the improvement, I am induced to submit the following outline of my communication to that journal, with some additions, any notice of which, should you think it worthy a place in your valuable publication, will greatly oblige.

I am, Gentlemen, yours, &c.,
JAMES F. COLE.

29, Devonshire-street, Queen-square,
Bloomsbury, Sept. 28th, 1858.

My first design (which, through a varied course of experiments, has led to the improvement above referred to) was to discover means of counteracting the objectionable liability of *watches generally* to the influence of external motion, as in riding, or by improperly moving the watch instead of the key in winding. Those causes, however little they may heretofore have been regarded as irreparable, must have always operated, as they are known to do, not only in inducing error of acceleration on time, by excess of vibration and consequent reaction of the balance, but also not unfrequently subjecting the balance pivots and other parts of the escapement mechanism to injury. These very delicate bearings, the pivots, if only in the slightest degree bent by concussions of the ordinary abrupt lever banking, immediately destroy

the equilibrium of the balance, and consequently the previous correctness of performance, which, in ordinary lever watches, must be the result of adjustment to a mean of those influences, admitting all other points to be correct.

The effects above stated will be at once manifest to any observer by a careful trial of any detached lever seconds watch of usual construction, first comparing the time or noting the difference with any other seconds watch or clock. If the watch under trial in the hand be subjected to a slight circular motion agreeing with the plane of the balance (or dial plate), the seconds hand will indicate an acceleration of say, *from three to thirty seconds per minute of time*, according to the increased momentum of the balance by the force applied under agitation of the watch. I would, however, advise that very great care be taken in such trial of an ordinary lever watch, particularly those having heavy balances, or rather that the trial be carefully avoided, as breakage of the impulse pin or pivots would be the probable result; but, if a watch of my improved construction, entitled the "resilient lever," be fairly subjected to the above trial, no acceleration on time or injury can occur from the trial, and therefore is not likely to happen under any similar circumstances.

The above effects I have produced by various modifications of the resilient action of the lever by spring bankings, &c., all of which involved additional work and are rejected; the final plan adopted being the employment of an additional incline plane either on the escapement-wheel tooth or on the lever pallets, so as to produce a double recoil action of the pallets and lever, by the wheel pressure on the respective lockings. I thus give to the lever the new resilient property, which allows the impulse pin to pass the fine wedge-like extremities of the lever fork by a slight displacement of the lever, on the balance, making more than a complete revolution from the point of rest, the wheel pressure instantly restoring the lever to its first condition of simple action with the balance. In addition to the above, a simplification results from the disuse of banking pins, and also of the lever guard pin and roller. The guard pin and roller may, however, be used at discretion. A still further advantage is gained by the improved form of the wheel teeth and pallets, which admit of closer scaping with perfect freedom, and with an economy of power otherwise lost in drop, admitting the employment of a greater weight of balance and a stronger balance spring.

This improved escapement is also less liable to disarrangement in the process of cleaning, though done by persons previously unacquainted with the principle, and, by reason of the improved form of the wheel teeth and reduced pallet angles, is found to retain the oil better, and maintain more permanently the proper extent of vibration.

In reference to the time-preserving property of the above principle, I may here mention that similar effects were produced on the chronometer and duplex escapements, various examples of which are now extant in watches completed and sold by me from 1843 to 1849. J. F. C.

THE REVOLVER.

The *Times*, in a leading article a few days since, gave deserved credit to the efficiency of the revolver in general, as an arm of warfare. It instanced, amongst other proofs of the formidable nature of this little weapon, the fact of the 8th Hussars, being sent after a large and retreating body of sepoys, the whole of whom were in a few seconds despatched with this beautiful piece of mechanism. As the history of the revolver has been one of great interest, and one which has had as many pens to chronicle its progress towards its present state of perfection as most of our modern inventions, it may not be amiss to place upon record that a Company has been formed in Chicago, United States, to manufacture revolvers, partly for the American Government and partly for the public use. But this fact would scarcely merit allusion had the patent thus worked by American capital and enterprise been an American one. This is not, however, the case; our countryman Mr. William Adams having had the honour to sell, and the satisfaction to pocket a large sum in liquidation of, the privilege conceded to others to manufacture in that country. We glean that this result was brought about by the testimony given by the American Government to the excellence of Adams's pistol, which was first made trial of by the United States navy, and was afterwards succeeded by two extensive contracts, which were intended to, and did, supersede the native revolvers before in use. This is certainly a fair theme for congratulation, inasmuch as "revolvers" were at one time foremost amongst those "Yankee notions" in which brother Jonathan very fairly boasted his superiority over "the Englishers." Nor were we slow to acknowledge the fact, and to give him the credit thereof. The American press, with a generosity we would willingly see emulated upon this side the Atlantic, has been the first to concede to Mr. Adams the advance he has made, and is congratu'

ing their Government upon a determination which has been alone influenced by a sound judgment and discretion. We find Mr. Adams's name three several times of late upon the Patent List, and each of these for "improvements in revolvers." The first is for a simple although important addition to the security of the arm, whereby an accidental discharge is rendered next to impossible; the second is the application of an eccentric lever to the ramrod, which is so constructed as to give a direct and equal pressure upon the charge; and the third and last is for a contrivance which adds the power of half-cocking to the trigger. We are reminded that it is now two years since our own War Department issued a minute that no more "American revolvers" should be issued from store, arising from the difficulty which was experienced in the repairing of the large proportion of those returned defective from the Black Sea.

THE USES OF CROSS-CUT STONE.

Gentlemen,—In compliance with your suggestion, I continue my remarks upon this subject. The use of fire-stone cut in slices applies to the following:

1st. The preparation of saccharine from plants, such as sugar-cane.

2nd. The preparation of fibre from fibre-bearing plants, such as flax or hemp.

3rd. The curing and drying, and even roasting, of berries and grains, such as coffee, cocoa, barley, &c.

4th. The baking of farinaceous food.

5th. The warming of edifices, by the formation of smoke-consuming furnaces.

1st. Sugar from the cane is made at present in the very rudest manner. In the French islands, experiments have been made in slicing the cane, but to dry or desiccate on iron or metal was impossible, and I claim to be the first to demonstrate the advantages of using stone, the porous action of which will cause the heat to drive the particles out sooner than any other means. This I have tried hitherto only with rhubarb and beetroot sliced. After the drying process, the sugar will be washed out of the sliced cane, and, as the acidity and albumen would be destroyed by the fire, no lime (as used at present) would be required. As before said, the French chemists advanced the idea of drying after slicing, but that could not be effected by metal plates. How ridiculous does it appear to us to see sugar spoilt by the present way of grinding in rollers, and the addition of lime, and sent home here to be acted on by animal charcoal (after a loss of from 10 to 20 per cent. on the voyage home), and then returned to be consumed in the West Indies, after voyages of 8,000 miles, to the Mauritius of something under 20,000, and to Calcutta and Manilla still more! Whereas it might as well be made pure and white at once, and at less expense, than by the old process of iron boilers and vacuum pans, and without the destruction of property besides. The sweet water would be evaporated in earthenware vessels by means of coals, and the powdered vegetable matter or refuse cane would go back to the soil—the very finest enricher for subsequent crops.

The proprietor of a pottery at Lambeth informs me that we only require an interposing medium in the shape of a slice of fire-stone to break the flare, and then much that is now evaporated in metal can be effected in earthenware.

2nd. What a better preparation of flax and fibrous plants by drying on stone flues will lead to may astound some minds, especially those blind enough to be averse to progress. Flax and hemp at present, after being cut, are allowed to dry on the ground several days previous to steeping and scutching, which greatly injures the fibre, by binding the vegetable matter with the sand, rendering the cleansing and bleaching a most difficult process. With clean flax much finer threads would be made for sewing machines. Shoemakers would have no complaints to make or knotty threads to work with. Linen would be made so fine and soft in the piece that it would absorb the perspiration on the skin, and supersede all irritating flannel for poor consumptive patients. Cotton would fall in value, and the slave trade, so disgraceful to professing Christians, receive a substantial check. Linen if made so fine would be a great rival to silk for aërial purposes, and would no doubt form a denser receptacle for gases or caloric than silk and oil. Brown linen would give way to white, and the chemicals now used for bleaching and retting the fibre would be entirely superseded. I believe that the problem of cleansing the New Zealand flax would be made easy by drying it on the transected stone.

3rd. The curing and drying of berries I mentioned in my last. A new idea is that of roasting or parching coffee, and even barley, for beverage; and I do not see why the tea leaf would not benefit by drying on stone instead of metal, used by the Chinese.

4th. The baking of farinaceous food is one of the most important applications. I hope shortly to be able to present the proper fire-stone to the public for the building of ovens. Man is prone to follow that which is good, so that it is simply a matter of time when we eat pure and unadulterated bread.

5th. Wherever metal is used for stoves for warming, the atmosphere is rendered unwholesome. My idea of using the sliced fire-stone as a smoke-consuming box or furnace will, I trust, ere long be exhibited to the public.

As regards stones for filtration of oils and juices, I may say that I look forward to the time when we shall have vegetable oils, say of olive, palm, and cocoa-nut, perfectly pure and devoid of rancidity, which arises from the decomposed vegetable matter left in the same after expression by the mill. I live in hopes of seeing the juice of the grape and other fruits filtered through slices of sandstone, which will so purify them as to cause fermentation to be impossible. Then will men be able to drink without intoxication, and crime arising from such cease. I could say more, but feel that proofs are worth much theoretical musing. If any one require more on the subject, I shall be most happy to detail fully all my experiments on this interesting idea, and I once more express thanks to you, Gentlemen Editors, for the publication of the letters. I know that a good idea propagated does good to all; and my earnest desire is that a speedy result may be manifested by scientific men investigating the subject.

I am, Gentlemen, yours, &c.,
C. Mc Dick,
Formerly of Trinidad, West Indies.

ELONGATED PROJECTILES.

Observations on Muskets, Rifles, and Projectiles. By Henry Wilkinson, M.R.A.S., M.S.A. Third Edition.

Gentlemen,—In the above pamphlet, page 23, is the following: "Every experiment proves the decided advantage of the elongated ball over the spherical one for all rifled arms, although the spherical is the best for smooth bores. There is no novelty in this. S. Robins suggested it more than a century ago; and Staudenmayer, of London, fifty years since, made the bullets for his air-guns cylindro-conical, very nearly the same form as that which recent experiments have determined to be the best." The form of Staudenmayer's rifle bullet for his rifle air-gun was not cylindro-conical; it was spherical, with projections round its zone to suit the grooves of his rifle; the small pointed cone on its front was to keep it upright in the barrel when ramming home; the head of the ramrod had a cavity in it to suit and receive the cone and keep the bullet steady. I supplied myself with one of these air-guns thirty-five years ago, and inquired of Staudenmayer for what purpose the small cone on the front of his ball was, and he replied as above stated. His rifle bullet was *solid;* it would not answer to have it of a form cylindro-conical, as it would then be too *heavy* for the condensed air to project it any distance. When I elongated it, I cast it *hollow* at the base, for the double purpose of making it of a weight suited to the power of the condensed air, and to place the centre of gravity forward, arrow-fashion.

I am, Gentlemen, yours, &c.,
J. Norton.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

Baudouin, F. M. *Improvements in electric telegraph cables.* Dated Feb. 20, 1858. (No. 333.)

This consists, 1. In substituting for the central conductors of copper conductors of metal of great tensile strength, such as iron wire, cords, or ropes. 2. In the application of protecting iron-wire coverings or envelopes, by alternately superposing layers of iron or steel wires and layers of textile impervious material. 3. In applying, at the time of the immersion, coverings intended to complete, lighten, and strengthen the cable, such coverings being appropriate to the local conditions to be satisfied. 4. In the application of this method of lightening and supporting to heavy cables, such as already exist, to get rid of the difficulties presented during the submersion. 5. In constituting a multiple conductor, possessing at once great strength and small volume, by joining separately insulated copper wires to the iron wire, cord, or rope forming the principal conductor of the cable, by interposing these isolated copper wires between the spirals of the iron wires of the cord. 6. In using aluminium for the conductors of submarine cables.

Rey-Rimels, H. *A new process of manufacturing potato meal or fecula.* Dated Feb. 20, 1858. (No. 335.)

The potatoes must be first washed, then sliced, and received in baskets, which are then immersed in a heated solution of common salt. They are then carried into a heated chamber, after which they are in a fit state to be reduced into meal by grinding. This meal is adapted for the manufacture of semolina, vermicelli, maccaroni, tapioca, and other Italian pastes.

Betts, W. *A new manufacture of glazed or enamelled paper.* Dated Feb. 20, 1858. (No. 340.)

This consists in preparing paper with size and colour, and burnishing the same by two rollers moving like the rollers of an ordinary rolling mill, except that the surface of one revolves with a different velocity to the other.

Schaub, G. *A new or improved manufacture of certain kinds of printing type and other printing surfaces.* Dated Feb. 20, 1858. (No. 341.)

This relates to large printing types (usually made of wood or of type metal), and also to blocks, stereotypes, &c. In manufacturing printing types the patentee prefers to make the head of copper by electric deposition. He attaches the type head to a body of cast iron, hollow on its underside, by screws or pins, and he places between the type head and cast-iron body gutta percha, cement, or soft metal, which fills up the type head, and embeds it firmly. The type head may be strengthened by solder fused to its back.

Davis, J. *Improvements in cornets and other wind musical instruments.* Dated Feb. 22, 1858. (No. 342.)

The patentee, 1st, constructs reservoirs in any of the bends of the instrument. He perforates the

reservoirs and encloses the perforations in a tube filled with an absorbent substance, which prevents the escape of air, but allows the water to pass off. 2nd, for preventing noise, he employs double conical springs. 3rd, instead of drawing out and pushing in the tuning slide by the hand, to obtain the required pitch, he uses a graduated tuning slide, worked by a screw and nut.

HALL, W. *Improved apparatus for working railway breaks.* Dated Feb. 22, 1858. (No. 344.)

This invention was described and illustrated at page 385, No. 1811, vol. 68.

POTTS, J. *Improvements in machinery for cutting and shaping toothed gearing.* Dated Feb. 22, 1858. (No. 347.)

This invention cannot be described without engravings.

PULS, F. *The manufacture of certain hydro-carbons.* Dated Feb. 23, 1858. (No. 348.)

This consists in distilling pitch with earthy alkaline or metallic oxides, sub-oxides, or carbonates, so as to obtain hydro-carbons of an oily or greasy nature.

JOHNSTON, W. *Improvements in apparatus for regulating or controlling the flow or passage of fluids.* Dated Feb. 23, 1858. (No. 350.)

This relates to valvular contrivances of the flexible partition class, and cannot be intelligibly described without engravings.

MCLENNAN, W. *Improvements in the manufacture or production of boots, shoes, and other coverings for the feet.* Dated Feb. 23, 1858. (No. 351.)

This relates especially to boots and shoes with moulded gutta-percha soles, the actual lasting of the boot and shoe being accomplished in a moulding apparatus, by means of which the gutta-percha soles are shaped and attached to the boot or shoe.

TOYNBEE, E. *Improvements in the manufacture of manure.* Dated Feb. 23, 1858. (No. 354.)

This relates to dissolving and disintegrating wool, horse hair, bristles, leather, flesh, woollen rags, &c., for converting them into manure. by treating the same with sulphuric acid.

WHITE, G. F. *Improvements in door and other locks.* Dated Feb. 23, 1858. (No. 355.)

Here each lock is constructed with two bolts, which are capable of being geared together, so that when one one is pressed back or unlocked the other is pressed out from the lock.

NEWTON, W. E. *An improved process for producing photographic pictures or designs on the surface of stone or metals, so that impressions may be taken therefrom by the process of lithographic printing.* (A communication.) Dated Feb. 23, 1858. (No. 357.)

The object here is the production of a photographic picture upon the surface of a lithographic stone, from which impressions may be taken by the ordinary process of lithographic printing.

SMITH, S. *Improvements in apparatus for ensuring the correct action of the safety valves of steam boilers.* Dated Feb. 23, 1858. (No. 359.)

Two spiral springs are here used coupled at their smaller ends, and enclosed in a case which is pressed on by a screw, by which the pressure can be regulated. As the box is raised or lowered by the screw it gives motion to a rack which drives a pinion on the axis of a pointer, which will indicate the pressure on the valve.

BORLASE, E. *Improved apparatus for separating metals and metallic ores from mineral substances.* Dated Feb. 24, 1858. (No. 360.)

This relates to heating ores so as to separate the metallic portions from the other mineral substances, or from each other, and principally consists in a series of conical reservoirs in combination with sieves and a piston or plunger, for agitating the substances submitted to the operation of the apparatus. It cannot be completely described without engravings.

HENDERSON, J. *Improvements in shells or explosive projectiles.* Dated Feb. 24, 1858. (No. 362.)

This shell consists of an outer and an inner chamber, the two being concentric. The internal shell is cast thin, and is used for the explosive agent. It is connected with the external shell by supporting pieces. For charging the inner chamber and attaching the fuse, a communicating neck is cast between the two shells. The space between the two chambers is for bullets or loose missiles. It is charged by an aperture on the opposite side, both openings being closed by a screwed plug. The explosion breaks up the shell on all sides into a greater number of pieces than usual.

PETRIE, J. *Improvements in apparatus for regulating the flow of steam.* Dated Feb. 24, 1858. (No. 365.)

This relates, 1. To an apparatus for determining by the action of the governor the quantity of steam that shall pass to the engine, and for admitting steam thereto by a stop valve. 2. To a method of communicating motion from the governor to valves. Reference to the drawings is essential to a complete description.

NEWTON, W. E. *The application to carts or other vehicles of apparatus for weighing the load contained in such vehicles.* (A communication.) Dated Feb. 24, 1858. (No. 367.)

This consists in the use of a system of levers and a frame applied between the body of a cart, &c., and its axle or axles, and combined with a scale beam or steel yard attached to the body so as to weigh the load upon the vehicle. Also in securing the body of the cart, &c., firmly to the axles when the weighing apparatus is not in use, and in bringing the cart body and weighing apparatus into an operative relation when the weighing is to be performed.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

SYERS, J. M. *Improvements in the decomposition of salt, and in the abstracting of metals from their ores.* Dated Feb. 19, 1858. (No. 317.)

This consists in immersing one end of a metal wire in a mixture of any ore and water, and the other end in a solution of common salt.

CHAMPION, J. *Improvements in spinning cotton, silk, flax, wool, and other fibrous materials.* Dated Feb. 19, 1858. (No. 318.)

This consists in uniting thread or yarn, already spun, with the roving as it is being drawn through rollers, the two being united at the point of contact at the front, bottom, and top rollers of the usual spinning or roving machines, whence it is then delivered to the spindle and flyer to be twisted together and thence to the spindles of mules or bobbins of throstles or roving frames.

MAW, E. *Improvements in the manufacture of iron wheels.* Dated Feb. 19, 1858. (No. 320.)

Here the felloes are of angle iron, and the bosses or naves are cast on discs of wrought iron, which project beyond the cast iron so as to have spokes fixed thereto. The spokes are of angle iron, and the ends are respectively fixed by rivets or bolts to the webs of the outer rings and to the projecting parts of the wrought-iron discs of the naves or bosses.

BRAZENOR, T., sen., and G., jun. *Certain improvements in mill bands.* Dated Feb. 19, 1858. (No. 321.)

This consists in the application to mill bands of tawed in contradistinction to tanned leather.

BROWN, I. and J. *Improvements in machinery or apparatus for reducing bones.* Dated Feb. 19, 1858. (No. 322.)

Here a row of circular saws are driven at a high velocity, the bones being fed thereto by a simple hopper, or by pressure from springs, so as to keep them against the cutting surfaces. Other feeding mechanism may be adopted, the main feature being the arrangement of a number of revolving cutters side by side on one shaft.

LITTLE, R. *Improvements in machinery or appa-*

ratus for washing and mangling. Dated Feb. 19, 1858. (No. 327.)

For a washing apparatus a rectangular box or tank is used. A little above the bottom there is a horizontal grating of rounded bars ranged transversely. A rocking frame rests on the grating, and the underside of it is curved, and formed of rounded bars arranged transversely like the grating. In the mangling apparatus three rollers are employed as usual; they can be easily removed without taking the whole frame asunder. The mangling pressure is applied by weights, to be uniform, whatever thickness of articles passes between the rollers. The top roller carries a loose pulley on each spindle, and over each pulley a cord or chain is passed, being fixed to the framing on one side, and connected on the other to a lever arranged near the floor. It is to the outer ends of these levers that the weights are applied.

METCALF, T. *Improvements in the purification of crude tar oil, rendering the same suitable for lubricating machinery and other similar purposes.* Dated Feb. 20, 1858. (No. 328.)

This consists in distilling tar for separating light hydro-carbons and carbonaceous particles, so as to render the tar oil more fit for lubricating machinery and similar purposes, and digesting the oil with siliceous earths, lime, alkalies, and mineral or vegetable acids, combined or separate.

GENTILE, G. *Improvements in ornamenting lace, netted, knitted, and woven fabrics.* Dated Feb. 20, 1858. (No. 331.)

Here small pieces of coral, or rock coral, are used, each perforated to admit a thread, and in the making of lace, netted, knitted, or woven fabrics, threads are worked in having pieces of coral thereon, and so introduced as to produce the desired pattern or ornament on the fabric.

GREEN, T. *Improvements in mowing machinery.* Dated Feb. 20, 1858. (No. 332.)

This consists in having two swivel wheels in front and one behind; they work similarly to castors; also two levers and two catches instead of one. These catches are fixed to the two drums instead of to the driving wheel. The drums are loose on the shaft, so that, with a spring to keep the levers in their proper places, the catches are self-acting, and the drums will turn either way, and with the advantage of the front and back swivel wheels the machine will turn much more easily, and will mow close round the smallest shrub or plant.

GREENE, W. and M. C. *Improvements in joining soft metal pipes.* Dated Feb. 20, 1858. (No. 334.)

This relates only to lead pipes, and to the tin or soft metal pipes used for gas. The inventors throw out a flange on each of the ends of pipe to be joined. The two flanges are brought together, and a part of a screw coupling placed on each (the one male and the other female). The female receives the two flanges and screws on to the male, binding the two flanges firmly together. The two screwed parts are both placed loose on the pipes, and are furnished with suitable parts for the use of wrenches.

MYERS, A. *Improvements in the manufacture of caps or coverings for the head.* Dated Feb. 23, 1858. (No. 336.)

This relates especially to military or forage caps, and consists in forming a cap, and also a covering, combined in one, so that the cover is entirely concealed from view when not required to be in use. The cover is attached to the edge of the back part of the lining of the cap, and between the band, and also between the cloth covering of the cap, a pocket is formed to contain the cover when not in use. When the cover is required to be used it is taken out of the pocket and drawn forward over the cap.

CLARK, W. *An improved rotary engine.* (A communication.) Dated Feb. 20, 1858. (No. 337.)

This cannot be described without engravings.

SWORN, J., and T. WESTON. *An improved adhesive composition for whitening and clearing the surface of stones.* Dated Feb. 20, 1858. (No. 338.)

This consists in the union and reduction to powder of 46lbs. of hearthstone; 10lbs. of pipe clay; 20lbs. of common whiting; 5lbs. of chalk lime; 5lbs. of starch; 16lbs. of common size; 10lbs. of common glue, all making 112lbs. These materials, after being mixed and passed through a sieve, are ready for use.

CATLIN, G. *Improvements in the construction and propelling of steamers.* Dated Feb. 20, 1858. (No. 339.)

The inventor forms a groove in the hull of the vessel under its centre, from the bow to stern, into which groove, and through the after part of it, a strap with paddles is delivered by an upright wheel; the strap and paddles are lifted by another wheel at the stern.

CORY, W., jun. *An improvement in the manufacture of artificial fuel.* Dated Feb. 20, 1858. (No. 343.)

Here small coal, mixed or not with other matters, is boiled with water and filled into moulds (by preference heated), where it is subjected to pressure.

BROOMAN, R. A. *An improvement in treating ores of precious metals.* (A communication.) Dated Feb. 22, 1858. (No. 345.)

This consists in treating auriferous pyrites with acetic or other similar vegetable acid, in order that the gold may be liberated and amalgamated more easily.

BROOMAN, R. A. *Improvements in machinery for effecting the amalgamation of precious metals.* (A communication.) Dated Feb. 22, 1858. (No. 346.)

This consists in the use of a double concave muller extending diametrically from side to side of the tub in which it works, leaving space on each side of it, and revolving upon a central and vertical axis.

TELFORD, R., and M. HOPE. *Improvements in castors for furniture.* Dated Feb. 23, 1858. (No. 349.)

This consists in applying to the sides of the bowls of castors discs of gutta percha, mother-o'-pearl, papier maché, porcelain, glass, marble, slate, wood, iron, vegetable ivory, &c., either plain or coloured.

BROOMAN, R. A. *Improvements in apparatus for separating substances of different specific gravities.* (A communication.) Dated Feb. 23, 1858. (No. 352.)

A conical drum, having its larger end closed and its smaller end open, is mounted upon a horizontal axle. The cover of the larger end receives the feeding hopper. The drum at its larger end is placed partially in a trough of water, and is pierced with holes, through which the water, which is higher than they, enters as the drum is rotated. The surfaces of contact between the rotating drum and the sides of the trough are packed. The drum is caused to rotate by bands, pulleys, gearing, &c. The centrifugal action of the drum and the motion of the water stir up the materials, and, while the heavier roll down the inclined side of the drum and through the holes into receptacles in the trough below, the lighter will be carried up the side of the drum, and, passing out at the end, will fall down a draining grating, and be deposited in receptacles.

SHEPARD, E. C. *An improvement or improvements in depositing metals and metallic alloys by electricity.* Dated Feb. 23, 1858. (No. 353.)

This relates, first, to producing by means of an electric current and an anode or plate of silver alloyed with nickel, a deposit of alloy of silver and nickel. The nickel makes the silver harder, and bears a better polish, in addition to its great economy. Secondly, to give to iron, zinc, &c., the appearance of bronze, brass, copper, &c., the patentee dissolves cyanide of potassium in pure water, then sulphate of copper in pure water, then sulphate of zinc also in pure water, each solution by itself. He then mixes the cyanide of potassium, or a portion of it, with the sulphate of copper solu-

tion, until it becomes clear, and then mixes the sulphate of zinc solution with the cyanide of potassium, until it becomes clear. After this he mixes all the solutions in one vessel, and puts into it caustic potash and cream of tartar. When the metals are put into the solution for plating, if not quite smooth, add more cream of tartar. To make the colour of the brass red, use a copper anode or plate; to make the colour green, use a brass anode. When you want a rich colour, like gold, thrown upon any metal, the solution should be made hot while working.

PROVISIONAL PROTECTIONS.

Dated July 14, 1858.

1578. E. J. Maumené, professor of chemistry, and L. B. Jaunay, wine merchant, of Reims, France. An improved method of and apparatus for the production of sparkling wines.

Dated July 24, 1858.

1673. H. Wikoff, of Kensington-gore, esq. An improved aperient medicine, to be used in the shape of a biscuit, cake, or sweetmeat. A communication.

Dated July 29, 1858.

1712. A. Gallard, of Aldersgate-st. A new system of trusses. A communication.

Dated August 14, 1858.

1864. L. A. Forot, of Paris, merchant. A new mode of ornamenting fabrics, and in the apparatus connected therewith.

Dated August 21, 1858.

1903. M. Benson, of Craven-st., Strand, mechanical engineer. Improved apparatus for generating steam. A communication.

Dated August 23, 1858.

1912. C. Buono-Core, of Naples. A liquid or composition which when applied to substances of any kind will render them fire-proofs or uninflammables.

Dated August 26, 1858.

1934. J. Coates, of Lower Shadwell, engineer. Improvements in apparatus or machinery for obtaining and applying motive power.

Dated September 6, 1858.

2012. T. Warburton, of Astley, near Manchester, manager. Improvements in machinery for preparing cotton and other fibrous materials, and for doubling yarn.

2016. R. A. Brooman, of 166, Fleet-st., London, editor of the *Mechanics' Magazine* and patent agent. Improvements in printing or marking words or figures on papers, parcels, books, pages, tickets, and other articles requiring to be marked, printed, stamped, or addressed. A communication.

Dated September 7, 1858.

2018. J. Shanks, of St. Helen's, manufacturing chemist. Improvements in the manufacture of chlorine.

2020. J. Fyfe, of Greenock, brass founder. Improvements in stop cocks or valves.

2024. F. W. Brind, of Devonshire-st., Bishopsgate, wine merchant. Improvements in sewing machines. A communication.

2026. L. Pellissier, mechanician, and J. Puytorac, bailiff, of Bordeaux. Improvements in railway breaks.

Dated September 8, 1858.

2028. J. R. Rostron, of Edenfield, Lancaster, gentleman. An improved press for packing or pressing wool and other materials.

2030. J. F. Dickson, of Litchurch, near Derby, engineer. Improvements in the construction of taps, cocks, valves, hydrants, and other apparatus for regulating the flow of water and other fluids.

2032. W. Parsons, of Lambeth, manufacturing engineer. Improvements in apparatus to be applied to steam boilers, in order to keep the surfaces of the tubular flues free from incrustation.

2034. W. Parsons, of Lambeth, manufacturing engineer. Improvements in safety valves of steam boilers.

2036. R. A. Brooman, of 166, Fleet-st., London, patent agent. An improvement in the preparation of sulphate of quinine. A communication from P. G. Barry.

Dated September 9, 1858.

2038. J. G. Newberry, iron founder, of Cardiff. An improved machine for tapping nuts, bolts, and screws, and other similar purposes.

2039. J. Luis, of Welbeck-st. An improved life-preserver raft of buoyant mattress. A communication.

2041. J. Rowley, of Camberwell. A new compound material applicable as a substitute for leather and leather-cloth in the manufacture of various useful and ornamental articles.

2043. C. N. Kottula, of Liverpool, soap manufacturer. Improvements in the manufacture of grease for lubricating purposes.

2044. J. Tatlow, of Wirksworth, Derby, manufacturer, and H. Hodgkinson, of the same place, engineer. Improvements in railway breaks.

2045. T. Timms, of Greenwich, coachman. Improvements in bits.

2046. J. Wright, sen., and J. Wright, jun., of Caledonian-road, Islington, eyelet machine manufacturers. Improvements in machinery and apparatus used for preparing fabrics or materials to receive eyelet holes or fastenings, and fixing eyelet holes, and in fastenings for stays and other articles.

2047. W. Nimmo, of Manchester, cotton spinner. Improvements in weaving checks in power-looms.

2048. A. Baader, jun., of Mittenwald, Bavaria. Improvements in the preparation of lubricating compounds.

2049. W. Clark, of Chancery-lane. Improvements in materials for dyeing and printing. A communication.

Dated September 10, 1858.

2051. J. Parker, of Bradford, York. Improvements in steam boilers.

2053. J. P. Kœnig, of Paris. Improvements in a surgical instrument called a pneumatic catheter.

2055. F. W. J. Johnson, of London. Improved means of communicating between the passengers, guard, and engine-driver on railway trains.

2057. W. E. Newton, of Chancery-lane. An improvement in water-wheels. A communication.

2059. W. Toshach, of Gloucester, engineer. Improvements in pile-driving machines.

Dated September 11, 1858.

2061. L. Hill, of Port-Glasgow, iron ship-builder. Improvements in apparatus for lowering or paying out ships' chains and anchors.

2063. F. Giesbers, of Bow-common, civil engineer. Improvements in the manufacture of coke.

2065. H. Page, of Whitechapel, glass merchant. An improved crown or round glass, and apparatus for manufacturing the same.

2067. H. Wikoff, of Kensington-gore, esq. A new tonic medicine, for the cure of coughs and diseases of the chest. A communication.

2069. L. Kaberry and T. Mitchell, of Rochdale, managers. Improvements in machinery or apparatus for preparing for spinning and spinning cotton wool and other fibrous materials.

Dated September 13, 1858.

2071. W. Thomson, of Manchester, commission agent. Improvements in bleaching yarn, warps, or similar materials.

2073. J. B. A. Duglèré, of Paris. A new method of separating solids from liquids for disinfecting purposes.

2075. S. Hanbury, of the Birmingham Patent Tube Company, of Smethwick, Stafford, manufacturer. An improvement in the manufacture of tubes of copper, brass, and other metals.

2077. J. Turner, of Gresham-st., hatter. Improvements in the manufacture of hats.

Dated September 14, 1858.

2079. C. J. Redpath, of Limehouse, engineer. Improvements in ships' and other pumps.

2081. L. Vidie, of Paris, gentleman. Improvements in apparatus for measuring the pressure of fluids by the flexion of diaphragms.

2085. G. C. Grimes, of Wandsworth. Improvements in fusees, and in the means of manufacturing fusees.

2087. A. H. J. Bastable, of Ranelagh-road, Pimlico. Improvements in apparatus employed in the production of light. A communication.

2089. Hon. W. E. Cochrane, of Osnaburgh-terrace, Regent's-park. An improvement in the fastenings of railways.

Dated September 15, 1858.

2091. E. Smyth, of Brixton. Improvements in swimming belts and life preservers.

2093. W. G. Taylor, of Ashby-de-la-Zouch, gentleman. Improvements in the manufacture of gloves.

PATENT APPLIED FOR WITH COMPLETE SPECIFICATION.

2098. J. R. Scartliff, of Wolverhampton, mechanic. An improved burglar's detector. Dated September 17, 1858.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," September 28th*, 1858.)

1091. L. Pètre. "Application of glass."
1094. J. and W. Allen. "Treating pyrites."
1111. J. Brown. "Iron and steel."
1123. M. Brun. "Dyeing."
1128. R. A. Brooman. "Sulphuret of carbon." A communication.
1136. S. Bryer. "Photographic plates."
1140. P. Féron. "Truss."
1145. F. G. Underhay and J. L. Clark. "Taps; flushing."
1147. J. H. Johnson. "Curtain rods." A communication.
1151. A. Ellissen. "Railway signalling."
1152. I. Baggs. "Electric telegraphs."
1154. W. Clark. "Moul r geement." A communication.
1156. J. Edwards and T. Loveridge. "Buttons," &c.
1172. W. E. Newton. "Fire-arms and cartridges." A communication.
1182. W. Bayliss. "Tubular fencing."
1184. P. A. Fourgassié. "Cultivating land." A communication.
1185. M. Henry. "Fabric; sewing machine." A communication.
1186. S. C. Lister & J. Warburton. "Spinning."
1191. C. Cuit and A. Godefroy. "Railway brakes."
1192. W. Clark. "Preserving butter." A communication.
1193. T. Cowper. "Combing fibrous materials." A communication.
1195. V. L. Vodoz. "Lamps."
1200. T. Dunn and W. Irlam. "Moving carriages on railways."
1204. J. F. Lackersteen. "Splitting wood."
1209. E., R., and P. Sykes. "Spinning machines."
1218. J. Schloss. "Book-clasp."
1234. F. J. Candy. "Nets."
1244. J. Meiklejon. "Boilers; valves."
1247. J. Bethell. "Alum."
1253. H. Edwards. "Pipe-stem."
1293. D. Irons. "Mariner's compass."
1334. G. T. Stieler. "Generating steam; economising fuel."
1428. W. E. Newton. "Matches." A communication.
1514. J. Dodd and T. Phillips. "Slide valves."
1702. W. A. Gilbee. "Oxide of chromium." A communication.
1711. J. Musgrave. "Stalls."
1743. G. S. Hill. "Hydro-pneumatic machinery."
1834. J. Coates. "Motive power."
1944. F. J. Evans. "Purifying gas."
1951. G. White. "Furniture." A communication.
1980. A. V. Newton. "Air engines." A communication.
1989. W. E. Newton. "Locks." A communication
1990. W. E. Newton. "Springs." A communication.
2007. W. P. Piggott and S. Beardmore. "Fermented liquors."
2013. S. Hogg, W. P. Piggott, and S. Beardmore. "Electric telegraphs."
2017. H. J. Distin. "Musical instruments."
2038. J. G. Newberry. "Tapping nuts," &c.
2081. L. Vidie. "Pressure gauges."
2085. G. C. Grimes. "Fusees."
2087. A. H. J. Bastable. "Light." A communication.
2091. E. Smyth. "Swimming belts."
2098. J. R. Scartliff. "Burglar's detector."

The full Titles of the Patents in the above List can be ascertained by referring back to their numbers in the Lists of Provisional Protections previously published.

Opposition can be entered to the granting of a Patent to any of the parties in the above List who have given notice of their intention to proceed, within twenty-one days from the date of the Gazette in which the notice appears, by leaving at the Commissioners' office particulars in writing of the objection to the application.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

2122. J. Dale.
2125. W. Pollitt and J. Eastwood.
2129. J. Beattie.
2132. C. Manby and W. Piper.
2146. J. Norbury.
2163. R. L. Johnson.
2175. J. Beattie.
2189. F. Uchatius.
2191. J. R., R., and J. Musgrave.

LIST OF SEALED PATENTS.

Sealed September 2nd, 1858.

591. E. J. Mauwaring.
600. H. L. Muller.
604. J. Rowbottom and T. Standeven.
610. C. F. Quintin.
612. J. C. Wilson.
614. H. Gerner.
621. J. F. Brinjes, jun., and H. J. Collins.
622. W. and R. Wood.

623. J. V. Hielakker.
624. A. L. Thirion.
627. W. Crook.
643. H. Doulton.
653. J. Welch.
668. W. Davis and T. Harper.
670. F. Robinson and E. Cottam.
695. F. R. and J. A. F. Tavernier.
715. S. Minton and R. H. Thomas.
792. H. Whittles, J. Schofield, E. Leach, and J. Lord.
855. M. Henry.
905. J. Maitre.
1006. J. Whitley.
1178. J. Luis.
1552. W. E. Newton.
1592. C. W. Williams.
1600. P. Fairbairn.

Sealed September 25th, 1858.

634. J. Young.
635. W. Robjohn.
636. F. A. Chevallier.
637. R. A. Brooman.
638. W. Moxon, J. Clayton, & S. Fearnley.
642. R. M. Butt.
647. J. and J. F. Newman.
650. J. Bushell and T. Wright.
654. J. A. V. Burg.
656. F. Bousfield.
661. J. F. Spencer.
664. J. C. Durand.
665. I. and J. Brown.
669. W. Harding.
671. J. C. Durand.
672. W. Weallens.
696. F. J. E. Oosterlinck.
700. T. Boardman and J. Allcock.
714. E. Edwards.
1593. R. Brazier.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions.

NOTICE TO CORRESPONDENTS.

We have several communications in hand, for which we cannot find space this week.

Articles and Correspondence designed for insertion in the ensuing Numbers of the *Mechanics' Magazine* must reach the Office by the Tuesday of each week, at the latest. It is highly desirable that they should be forwarded earlier if possible.

CONTENTS OF THIS NUMBER.

LONDON: Printed and Published by Richard Archibald Brooman, of 166, Fleet-street in the City of London. Sold by A. and W. Galignani, Rue Vivienne, Paris; Hodges and Smith, Dublin; W. C. Campbell and Co., Hamburgh.

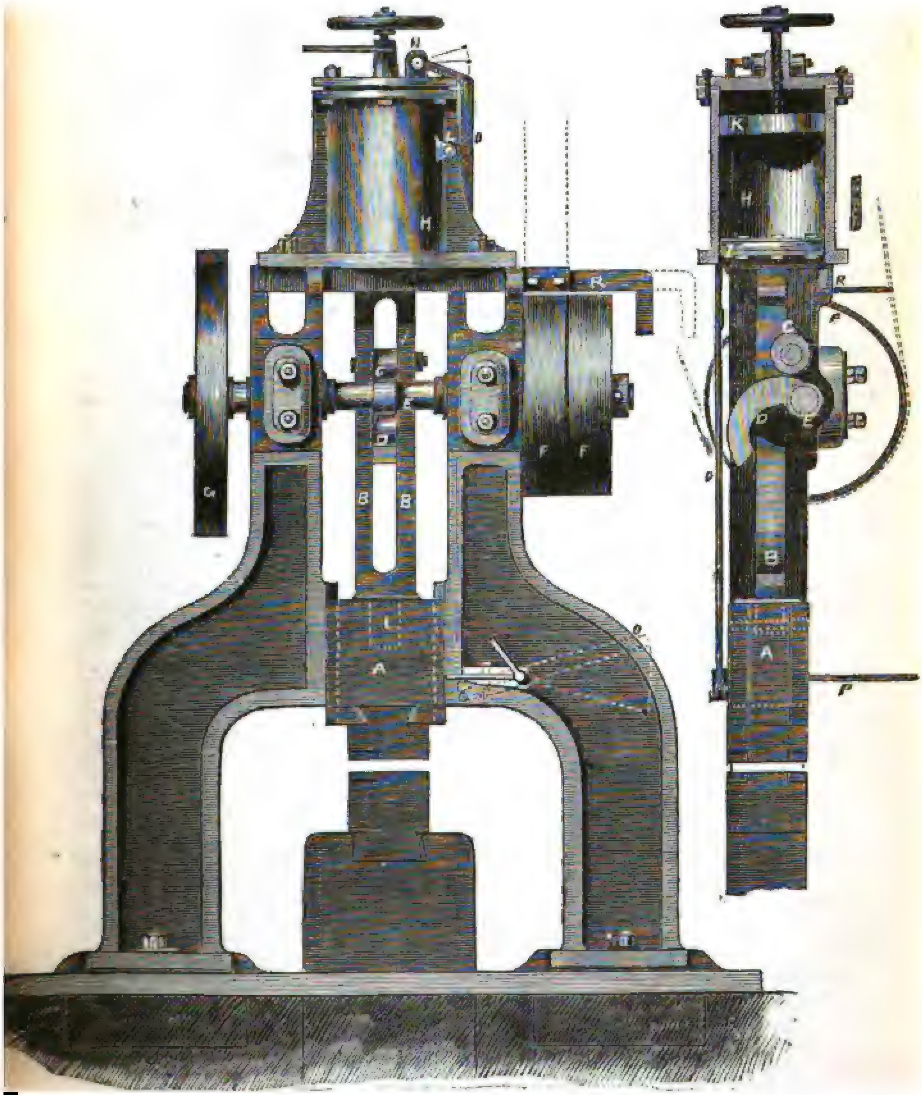
Mechanics' Magazine.

No. 1835.] SATURDAY, OCTOBER 9, 1858. [Price 3d.

Edited by R. A. Brooman and E. J. Reed, 166, Fleet-street, London, E.C.

WATERHOUSE'S COMPRESSED AIR FORGE HAMMER.

Fig. 1. Fig. 2.



WATERHOUSE'S COMPRESSED AIR FORGE HAMMER.

MR. THOMAS WATERHOUSE, of Sheffield, has invented and introduced a forge hammer intended for general light work in a smith's shop, such as forgings ranging from 1 to 5 inches diameter; it is driven by a strap as in the various kinds of friction hammers, but has combined with it a compressed air cylinder, the air in which acts as an elastic spring, which can be controlled so exactly by means of inlet and outlet valves and an adjustable head piston as to regulate completely the force and rapidity of the blow of the hammer, giving some important advantages in its efficiency and general utility. We derive the following remarks upon, and description of, the improved hammer from Mr. C. Beyer's paper read at the July meeting of the Institution of Mechanical Engineers.

The steam and friction hammers in general use, excepting the tilt hammers working with a spring or striking beam, are limited in their speed by the time required for the hammer to fall at each stroke, and do not admit generally of being worked at a quicker speed than about 80 blows per minute. But this speed is quite inadequate for light smithy purposes; and in the hammer now described the elastic action of the compressed air in the cylinder increases the velocity of the fall of the hammer so much as to allow of 120 to 150 blows per minute being readily obtained, the working of the hammer being usually limited to 130 blows per minute, which are as many as can be ordinarily dealt by a smith.

The present improved form of this compressed air hammer is shown in the annexed engravings. Fig. 1 is an elevation of the complete machine, and fig. 2 is a vertical section.

The hammer block, A, works between guides in the frame, as in Nasmyth's steam hammer, and is lifted by the rod, B, which is made double and flat, with a roller, C, fixed in the middle, projecting a little backwards from the centre line. This roller is lifted by the cam, D, which is forged solid upon the horizontal shaft, E, and works between the two halves of the hammer rod, being hardened on the face. The shaft, E, is carried by bearings in the framing at each end, and passes close behind the hammer rod, B; it has fast and loose pulleys, F, upon one end, and a small flywheel, G, upon the other. The hammer is driven by a strap on to the pulley, F, each revolution of the cam making one stroke of the hammer.

On the top of the frame is the air cylinder, H, open at the bottom, in which works the piston, I, forged upon the hammer rod, B. The air in this cylinder is compressed by the piston, I, each time the hammer is raised by the cam; and its elastic force in expanding again increases the velocity of the hammer in falling, giving a great increase to the force of blow when required, and to the number of blows that can be struck per minute. The elastic force of the compressed air is regulated by altering the quantity of air that is compressed by means of a second stationary piston, K, the height of which can be adjusted in the cylinder by a hand wheel and screw passing through the cylinder cover; by lowering this piston the space into which the air is compressed between the two pistons is reduced, and the pressure of the air proportionately increased, so as to increase the force of blow.

A cock, L, is fixed in the side of the air cylinder between the two pistons, by opening which the air is allowed to escape instead of being compressed; and by adjusting the opening of this cock the pressure can be reduced to any amount required, so as to vary the force of blow at any moment as desired during the working of the hammer. A valve, M, is placed in the upper piston, K, consisting of a circular flap opening downwards and kept close by a light spring, for the purpose of admitting air between the two pistons, in order to prevent a partial vacuum being formed between them, which would retard the fall of the hammer. As the cock, L, remains open during the fall of the hammer, a portion of the air will re-enter there; but this, entering only at the pressure of the atmosphere, will be much less than the quantity escaping through the same aperture under the compression. A second cock, N, in the cylinder cover controls the admission of the air through the flap valve, M, by partially closing which the admission of air is restricted, so as to reduce the pressure in the cylinder below that of the atmosphere at the end of the fall of the hammer; the blow is thus lightened by the excess of pressure of the atmosphere on the underside of the bottom piston, I, which takes off at that moment a portion of its weight.

The two cocks, L and N, are both worked by one rod and handle, O; they are connected together so that when one is closed the other is open, and when the side cock, L, is shut, so as to give the full force of the compression of the air upon the piston of the hammer, the upper cock, N, is then full open, to give free entrance for the air and allow the unchecked fall of the hammer. The motion of these two cocks is so arranged, by making the lever of the upper one double the length of that of the other, that the first

half of the upward motion of the handle, O, gradually throttles the opening of the upper cock, N, keeping the lower cock, L, shut; while the latter half of the motion of the handle opens the lower cock, L, to its full extent, and continues to throttle still further the upper cock, N.

A second handle, P, carries a projecting stud, which is used to hold up the hammer when required. A strap rod, R, works the driving strap on the fast or loose pulley, F, to start or stop the hammer, and serves also to regulate the speed at which the cam shaft is driven, by the slipping of the strap when only partially on the fast pulley.

In this hammer a light weight is raised, but a heavy blow is obtained from the increased velocity given by the recoil of the elastic air spring; and the great rapidity of the blows gives an important advantage in light forgings. The whole machine is readily under control, and a boy can work and instantaneously regulate it by moving the two hand levers, one shifting the driving strap for starting or stopping the hammer, and the other adjusting the inlet and outlet air cocks by which the force of blow is regulated. The value of this hammer where there are several strikers employed is strongly shown in working; and it can be made applicable to almost every kind of smith's work, doing as much as three or four strikers could do in the same time, and consequently saving heats, the importance of which in small forgings is a great consideration.

The hammer here described is one of the ordinary size, the falling parts being 4½ cwt., with a cylinder of 10 inches diameter and 8 inches stroke; the total weight without the anvil block is 54 cwt., and the weight of block recommended is 30 cwt. The cost of working the hammer when there is shafting already running is small, scarcely indeed appreciable; and the cost of repairs is found to be very slight.

CHEMISTRY AND MATHEMATICS.

The idea that we may ultimately succeed in subjecting the science of chemistry to mathematical analysis, although not a new one, is full of interest to scientific minds. Nor is it at all improbable that we shall succeed in doing this. The great progress that has been made in the application of mathematical processes to astronomical facts—even to the extent of predicting the existence, position, and magnitude of unknown planets—encourages us to hope that the lesser facts of chemistry, which come immediately under our cognizance, may ere long be similarly dealt with. That this hope is extending—notwithstanding the wonderful issues which would result from such a success, and which would stop short of creative power only—is shown by an admirable speech made by Sir John Herschel at Leeds, on his acceptance of the presidential chair of the chemical section of the British Association. After putting in a word of reclamation against the system of notation into which chemists, who for the most part are not algebraists, have fallen in expressing their atomic formulæ, which are gradually becoming more and more repulsive to the algebraical eye, he reminded the audience that as sciences do not stand alone, but exist in mutual relation to each other—as it is for their common interest that there should exist among them a system of free communication on their frontier points—the language they use and the signs they employ should be framed in such a way as at least not to contradict each other. As the atomic formulæ used by the chemist are not merely symbolic of the mode in which atoms are grouped, but are intended also to express numerical relations indicative of the aggregate weights of the several atoms in each group and the several groups in each compound, it is distressing to the algebraist to find that he cannot interpret a chemical formula (in its numerical application) according to the received rules of arithmetical computation. In a paper which he published a long time ago on the hyposulphites, Sir John was particularly careful to use a mode of notation which, while perfectly clear in its chemical sense, and fully expressing the relations of the groupings alluded to, accommodated itself at the same time perfectly well to numerical computation, no symbol being in any case juxtaposed, or in any way intercombined with one another, so as to violate the strict algebraical meaning of the formula. This system seemed for a while likely to be generally adopted, but it has been more and more departed from, and with a manifest corresponding departure from intelligibility.

The time is perhaps not so very far distant, said Sir John, when, from a knowledge of the family to which a chemical element belongs, and its order in that family, we may be able to predict with confidence the system of groups into which it is capable of entering, and the part it will play in the combination. A great step in this direction seems to have been made by Professor Cooke, of the Harvard University,

of the United States (in a memoir which forms part of the 5th volume of the Memoirs of the American Academy of Arts and Sciences), to extend and carry out the classification of chemical elements into families of the kind alluded to in a system of grouping, in which the first idea, or rather the first germ of the idea, may be traced to a remark made by M. Dumas, in one of his reports to the British Association, and which is founded on the principle of arranging them in series, in each of which the atomic weight of the elements it comprises is found among the terms of an arithmetical progression, the common difference of which in the several series are 3, 4, 5, 6, 8, and 9 times the atomic weight of hydrogen respectively. So arranged they form six groups, which are fairly entitled to be considered natural families, each group having common properties in the highest degree characteristic; and, what is more remarkable, the initial member in each group possessing in every case the characteristic property of the group in its most eminent degree, while the others exhibit that property in a less and less degree, according to their rank in the progression, or according to the increased numerical value of the atomic equivalent. "Generally speaking," said Sir John, "I am a little slow to give full credence to numerical generalizations of this sort, because we are apt to find their authors either taking some liberties with the numbers themselves, or demanding a wider margin of error in the application of their principles than the precision of the experimental data renders it possible to accord, so that the result is more or less wanting in that close appliance to nature which makes all the difference between a loose analogy and a physical law; but in this instance it certainly does appear that the groups so arising not only do correspond remarkably well in their theoretical numbers with those which the best authorities assign to their elements, but that it really would be difficult to distinguish the elements themselves into more distinctly characteristic classes by a consideration of their qualities alone, without reference to their atomic numbers. When we find, for instance, that the principle affords us such family groups as oxygen, fluorine, chlorine, bromine, and iodine self-arranged in that very order; or again, nitrogen, phosphorus, arsenic, antimony, and bismuth; when we find that it packs together in one group all the more active and soluble electro-positive elements, hydrogen, lithium, sodium, and potassium, and in another the more inert and less soluble ones, calcium, strontium, barium, and lead—and that without outraging any other system of relations, it certainly does seem that we have here something very like a valid generalization; and I shall be very glad to learn whether I have been forming an overweening estimate of the value and importance of such generalizations. I will only add on this point, in reference to what fell from our excellent President in his address, that this kind of speculation followed out would seem to me likely to terminate in a point very far from that which would regard all the members of each of these family groups as allotropes of one fundamental one, inasmuch as the common difference of the several progressions which their atomic weights go to make up, is neither equal to nor in all cases commensurate with the first terms of these progressions. For instance, in the chlorine group, the first term being 8, the common difference is 9. Something very different from allotropism is surely suggested by such a relation. It would rather seem to point to a dilution of energy of one primary element by the superaddition of dose after dose of some other modifying element, and this the more strikingly since we find oxygen standing at the head of very distinct groups having very striking correspondences in some respects, and very striking differences in others."

But all these speculations take for granted a principle, with which, according to Sir John Herschel, chemists have allowed themselves to be far too easily satisfied, viz., that all the atomic numbers are multiples of that of hydrogen. Not until these numbers are determined with a precision approaching that of the elements of the planetary orbits, a precision which can leave no possible question of a tenth or a hundredth of a per cent., and in the presence of which such errors as are at present regarded as tolerable in the atomic numbers of even the best determined elements shall be considered utterly inadmissible, can this question be settled; and when such gigantic consequences—so entire a system of nature—is to be based on a principle, nothing short of such evidence ought to be held conclusive, however seductive the theory may appear. Such precision is not necessarily unattainable, and he thinks he perceives a way in which it might be attained, but one that would involve an expenditure of time, labour, and money such as no private individual could bestow on it. But if the phenomena of chemistry are ever destined to be reduced under the dominion of mathematical analysis, it will no doubt be by a very circuitous and intricate route. We should therefore be all the more carefully on the watch in making the most of those classes of facts

which seem to place us, not indeed within view of daylight, but at what seems an opening that may possibly lead to it. Such are those in which the agency of light is concerned in modifying or subverting the ordinary affinities of material èlements, those to which the name of actino-chemistry has been affixed. Hitherto the more attractive applications of photography have had too much the effect of distracting the attention from the purely chemical questions which it raises, but the more we consider them in the abstract, the more strongly they force themselves on our notice, and we may look forward to their occupying a much larger space in the domain of chemical inquiry than is the case at present. That light consists in the undulations of an ethereal medium, or at all events agrees better in the characters of its phenomena with such undulations, than with any other kind of motion which it has yet been possible to imagine, is a proposition on which the minds of physicists are pretty well made up. The recent researches of Professor Thomson and Mr. Joule, moreover, have gone a great way towards bringing into vogue, if not yet fully to acceptation, the doctrine of a more or less analogous conception of heat. When we consider now the marked influence which the different calorific states of bodies have on their affinities—the change of crystalline form effected in some by a change in temperature—the allotropic states taken by some on exposure to heat — or the heat given out by others on their restoration from the allotropic to the ordinary form (for, though Mr. Gore considers his electro-deposited antimony to be a compound, at all events the state in which the antimony exists in it is an allotropic one)—when we consider these facts, in which heat is concerned, and compare them with the facts of photography, and with the ozonization of oxygen by the chemical rays of the electric spark, and with the striking alterations in the chemical habitudes of bodies pointed out by Draper, Hunt, and Becquerel; and when again we find these carried so far that, as in the experiments of Bunsen and Roscoe, we find the amount of chemical action numerically measuring the quantity of light absorbed—it seems hardly possible not to indulge a hope that the pursuit of these strange phenomena may by degrees conduct us to a *mechanical theory of chemical action*, itself. "Even should this hope remain unrealized," said Sir John, "the field itself is too wide to remain unexplored; and, to say nothing of discovery, the use of photography merely as a chemical test may prove very valuable, as I have myself quite recently experienced in the evidence it has afforded me of the presence in certain solutions of a peculiar metal having many of the characters of arsenic, but differing from it in others, and strikingly contrasted with it in its powerful photographic qualities, which are of singular intensity, surpassing iodine, and almost equalling bromine."

In concluding his speech Sir John said, "There is another class of phenomena which, though usually considered as belonging peculiarly to the domain of general physics, and so out of our department, seems to me to want some attention in a chemical point of view. It is that of capillary attraction. The co-efficient of capillarity differs very remarkably in different liquids, and no doubt also in their contacts with different solids, a fact which can hardly be separated from the idea of some community of nature between the capillary force and those of elective attraction. I hardly dare to hint," said he, "at the existence of some slight misgiving I have always felt as to the validity of the received statical theory of capillary action which carries with it the authority of such names as those of Laplace and Poisson. Any discussion of this point would be matter for another section of this Association, and if I here touch upon it it is only to observe that my impression of the requisiteness of a force *so far allied to chemical affinity as to be capable of saturation*, rests on other grounds besides that of the mere diversity of action above alluded to."

A NEW METHOD OF ROAD-MAKING.—The everlasting noise which is occasioned by the rugged material of our English roads, and the frequency of their being under repair, gives especial value to a fact which we find in the French papers. A new system of road-making has just been substituted for the ordinary roadway on a part of the Place du Palais Royal. A quantity of concrete, about 5 in. in thickness, is first spread out, and on that is applied a layer of bitumen reduced to powder and in a boiling state. On this latter, which is also about 5 in. in thickness, a quantity of river sand is sifted, and then the surface is pressed down by a heavy cast-iron roller, weighing about two tons. In a few hours after, the road thus made may be passed over by the heaviest wagons without the slightest impression being left by the wheels. The same system is now being applied to part of the Rue St. Honoré comprised between the Palais Royal and the Rue de Richelieu, and in the latter street as far as the end of the Théâtre Français.

MR. WHITEHOUSE AND HIS INJURIES.

As was, of course, to be expected, Mr. Edward Orange Wildman Whitehouse, "Electrician Projector," feels himself very much injured on finding that the Directors of the Atlantic Telegraph Company have not silently permitted him to deluge the press with vain, and foolish, and unfounded statements against themselves. Accordingly, we have before us a replicative manifesto from his pen, of such a length that it would occupy, if we were stupid enough to print it, about fourteen or fifteen of our pages! We have no doubt that other journals have been favoured with a similar document, but none have, so far as we know, reciprocated the author's kindness by publishing it. For our part, we really think it a great misfortune for Mr. Whitehouse that his health, which was not sufficiently good to enable him to do his duty by accompanying the late telegraph expeditions, has proved good enough to enable him to spend the whole of his time since in writing tremendously long and laborious documents in his own honour, and to the dishonour of everyone then associated with him.

He has managed to import an amazing amount of assurance into this last effort of his.

"Unconscious of the blow which has been secretly endeavoured to be struck against my character and conduct—engaged in peaceful and philosophical pursuits—unwilling to enter the arena of hostile controversy."

Such is the style in which he commences; ignoring altogether the fact that he was the first to strike blows at "character and conduct," to abandon "peaceful and philosophical pursuits," and to "enter the arena of hostile controversy." A man who is capable of this kind of tergiversation—nay, of open misrepresentation—forfeits all claim to public attention.

We will, however, waive our right to refuse him any further notice, and mention one or two of the leading allegations of his present paper, especially as we are by no means sure that the directors have acted with unimpeachable propriety and integrity towards him. Our readers will have learnt, however, to receive Mr. Whitehouse's statements with caution.

And first as to the money part of the question. Mr. Whitehouse states that he has not to this day been able to obtain possession of a single share. At the strong instance of the secretary he signed a deed acknowledging their receipt months ago, trusting to the secretary as a friend, a gentleman, and a man of honour; he has since applied formally, but in vain, for the delivery of these shares. "The secretary has had," he says, "in his possession for a month written orders from me, for the transfer of shares to the Knight of Kerry, and seven other persons, to whom I promised them. These orders have not yet been attended to."

Next, as to his inability from illness to accompany the ships, he states that at midsummer no objection was offered to his remaining at home; and he was even confidentially advised by their secretary to do so. The state of his health was due solely to continuous over-application to the details of the electrical operations under his charge.

Mr. Whitehouse next denies that he was informed of any "full meeting of the Board to be held on the 9th for receipt of reports from the scientific officers;" but he admits that he received a telegram:—"The Directors will be glad to have a telegraph every day, at present, as to the state of signals through cable, and any other interesting news." They knew, he says, that a written report could only have been given "by withdrawing my personal attention for many hours daily from more important duties." What a modest gentleman this is! How coolly he sets aside the instructions of his superiors and does only what seems good in his own eyes!

With reference to the entries in his log, Mr. Whitehouse says, any entry which may have been made in the signals' diary after the cutting of the cable could only have been written some hours after his departure from Valentia; he is, therefore, unaware of its nature. But he positively asserts that the amount of leakage or loss ascertained to exist upon the half-mile of cable nearest shore, and reported to him by telegraph during his journey to town, was nearly a hundred times as much as existed upon any equal length of Atlantic cable approved by him at the Gutta Percha Works during the manufacture; and, further, that a very few miles of cable, similarly imperfect at our own end of the line, would produce the variable embarrassment of signals which we have found, and give *precisely the results* obtained by the recent testings of the electricians employed by the Company.

"A fact of great significance has," he further states, "within the present week come to my knowledge, in connection with the probable seat of injury to the cable; a fact which I do not think I should be justified in withholding from the public. The officers of H.M.S. *Shamrock*, surveying that part of the coast, have recently given a strong opinion that, 'from soundings taken by themselves, the cable crosses a

bar, called the "Coast Guards' Patch," rising from about seventy fathoms to nine fathoms, almost perpendicularly.' This is situated just outside Doulas Bay; and, to quote further the words of a note received upon the subject, 'it is their opinion, that every swell of the tide rolls the cable from one side to the other, and is thus literally sawing it in two.' Another letter describes it as a 'sudden rocky descent, from nine to seventy fathoms, across which the cable lies.'"

Mr. Whitehouse's explanation of the manner in which he treated Mr. France does not, so far as we can observe, differ materially from the statements of the directors. *His* judgments and *his* determinations were supreme; he had no idea of obeying any-one who chose to suspect them fallible.

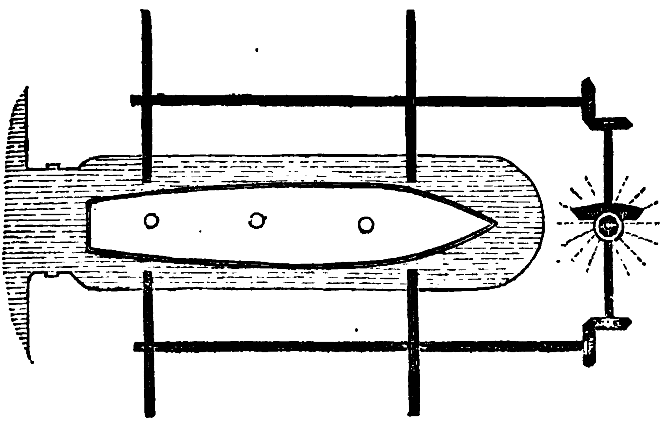
But we really cannot follow Mr. Whitehouse further. If he is desirous of having his case stated more fully in our pages, he must take the trouble to send us a much more succinct document than he has yet favoured us with. If any of our readers should wish to see his reply in full, either from an overweening apprehension that he is a badly-used man, or as a matter of curiosity, he can gratify himself by purchasing a copy through his bookseller, it having been printed by Bradbury and Evans, Whitefriars, London, since we commenced our remarks upon it. We will conclude with one other complimentary sentence from it.

"From the tone of Mr. Brett's letter," says this gentlemanly writer, "one would suppose that he, and he only, had contemplated the possibility of an Atlantic line; while he only in self-jubilation seems to emulate the frantic fooleries of the Americans in the person of Mr. Cyrus Field."

It is in such terms that Mr. Whitehouse —as he elsewhere remarks—manifests his "just respect for the public of two worlds!" As he is no longer a medical man himself, we venture to prescribe—for his health's sake—entire abstinence for the future from amateur labours in both science and literature.

HOLLAND'S IMPROVED METHOD OF CENTREING SHIPS IN DOCKS.

The blocks which receive the keels of ships in docks are ordinarily laid along the central line of the docks, and in docking a ship she is first hauled by hawsers and guys as far forward into the dock as may be required, and then by means of the



guys, and springs upon the guys, centred, or placed in a central position in the dock, that position being indicated by plumb lines at head and stern. This placing of the ship has to be done by hand, and inexpert officers usually spend a good deal of time in doing it, and not unfrequently get the ship athwart the blocks—sometimes nearly off them. This is, of course, a very serious matter, and a means of effecting the operation with despatch and certainty, which should not be dependent for its efficiency upon the skill of the officer in charge, would be of great use. In Her Majesty's dockyards especially, where the weight of many of the large ships that are docked is enormous, where hundreds of men are often made to wait idly for hours at the dock-side from the above and other collateral causes, and where we have ourselves seen ships placed sadly awry at times, it would be of consi-

derable service. In order to effect the object, Mr. J. Simon Holland, of Woolwich, proposes the arrangement represented in the engraving. He places a couple of longitudinal shafts along the sides of the dock, and connects with them 'thwart-ship shores or guides (by rack teeth or otherwise) in such manner that they shall be capable of being equally projected on opposite sides of the dock by means of a capstan at the dock-head. The shores or guides should be so fitted that when they both meet and press against the ship (before which one or other of them must have forced her into the middle) they shall be simultaneously disconnected from the revolving shaft. We need not enlarge upon the details of the plan, as the practical requirements of the case, and methods of supplying them, will be evident to men practically acquainted with the subject. A better plan of effecting the same object may possibly be devised, but Mr. Holland's would, we think, be found quite efficient, and might at once be applied at a very small outlay to a dock or two by way of experiment. The increasing use of very large ships in the merchant service renders such a device more and more desirable even there.

THE SUN AND LUMINOUS METEORS.

A CONSIDERABLE amount of attention has lately been given by scientific men to the phenomena of falling stars, shooting stars, fiery globes, and other luminous meteors. Professor W. Thomson has been led, by his mathematical speculations on heat, to the conclusion that the heat of the sun is maintained by the perpetual falling in upon his surface of the abnormal bodies moving in the solar system which appear to us as luminous meteors and shooting stars. And he conceives that he has shown that there is in those bodies an aboundable supply to keep up the heat of the sun, and that, by the effects of them, the sun may have gone on radiating heat for thousands and thousands of years without the smallest diminution. His views are the result of profound and complex mathematical calculations. In last year's report to the British Association, some speculations were mentioned referring to the apparent magnitude of the luminous discs of meteors, and the experiments of Professor Lawrence Smith, U. S., tending to show that spurious discs are formed by intensely bright bodies of an apparent size immensely exceeding the real dimensions of the solid matter. This subject has been considered at large in connection with the whole theory of meteoric bodies in a very recent work "Popular Physical Astronomy," by Mr. Daniel Vaughan, of Cincinnati, U. S., (1858). The main point of the author's theory consists in supposing that the universally diffused ethereal medium must be condensed on the surfaces of all cosmical masses; intensely so on the surface of the sun, thus giving rise to its light and heat; and in proportionate degrees on lesser bodies, such as meteorites. By their rapid motion, more especially when they graze or enter our atmosphere, it is excited to violent chemical action, giving rise to the development of light and heat. Their velocity on entering the atmosphere, and the consequent compression and resistance they encounter, are the causes of their being crushed into fragments, and thus appearing to explode before they fall to the earth. The author objects to the theory of Professor Lawrence Smith, and contends (from experimental illustration) that the apparent enlargements of discs arises simply from the reflective power of the surrounding air, and will, therefore, not apply to meteors out of our atmosphere. He also combats the theory of Professor W. Thomson as to the source of the solar light and heat from the impact of meteoric bodies. The chief defect in Mr. Vaughan's theory seems to be, to account for the nature and mode of excitement of the chemical action supposed; and again, to explain why on this hypothesis the earth and the planets are not also luminous.

Mr. G. J. Symons, M.B.M.S., has this year supplied the Association with a list of meteors observed by him in 1858, accompanied by a very remarkable table, by double entry, showing at a glance the number of meteors which were seen to pass *from* one constellation *to* another.

MR. HENLEY ON THE ATLANTIC CABLE.—A very interesting report upon the condition of the Atlantic cable has reached us since our arrangements for this week's Number have been completed. We have not space even for an abstract of it now, and therefore must defer its publication. On the arrival of his large magnetic machine he put it together and connected it with the cable, and has used it a part of every day since, sending sometimes reversals, and at others words and sentences. He is unable to tell whether they were received and understood, but hopes to find such has been the case on the receipt of intelligence from Newfoundland. Having a machine at one end only, even if they received properly they could not have answered better than before. But Mr. Henley has been encouraged by seeing more reversals and attempts to sends words from them lately than before.

ON A NEW METHOD OF CONSTRUCTING THE PERMANENT WAY AND WHEELS OF RAILWAYS.

BY W. BRIDGES ADAMS, OF LONDON.*

To obtain all the advantages of both the bridge-rail and the double-T-rail, while avoiding their disadvantages, is the object of the improvement about to be described; that is, the horizontal stiffness of the bridge rail with more than the vertical stiffness of the double-T-rail, with a lowered elevation, without any chairs or loose contact of iron with iron, and with the firmest joint yet achieved, making the line of rails a continuous yet expansive and contractile bar, on a continuous bearing.

The system was first applied on the North London Railway, where it has been in satisfactory use upwards of twelve months, and is now laid down on the Eastern Counties Railway. It is, therefore, a practical fact, having passed out of the phase of what is denominated amongst practical men "a scheme," that is, a theory or thought, as the following report of the engineer, Mr. Martin, will testify:—

"The experimental length of the suspended girder rail laid on the North London Railway has now been down about twelve months. It was purposely placed in a situation exposed to the severest test which the line admits of, at the foot of a steep gradient on a sharp curve, and at a station where numerous trains stop and pass through every hour.

"From the weekly reports furnished by the Company's inspectors, combined with my own occasional examination, I am able to state with confidence, that the result of the trial has been very satisfactory in respect of durability and of economy. The original outlay is less than that required for the ordinary modes of construction, and the cost of maintenance is trifling, while the road is smooth and easy for the traffic."

In this new construction the ordinary double-headed rail is not placed in chairs *on* cross sleepers, but is bolted *between* longitudinal sleepers of small scantling, which supply the place of cast chairs by continuous wooden supports. The bolts are either ordinary screw bolts or pieces of flat box with keys and washers passing through both rails and timber at three-feet spaces. The rail is thus supported by the upper table without resting on the lower, and the bearing surface on the timber is in a yard length equal to fifty-four inches, the chair in the same length being only equal to forty-eight inches, the former being continuous, the latter discontinuous. The bearing surface on the ballast is equal to that of the cross-sleeper rail with the sleepers three feet apart; and it is continuous, while the box sleepers are discontinuous. The height of the rail above the ballast is only five inches, while that of the ordinary cross-sleeper way is twelve inches. There is, therefore, a saving of one half the ballast. The rails are connected by brackets of angle iron, which are bolted to and through both rails and brackets at the joints, the brackets being bolted down on cross sleepers at the joints, thus securing the gauge.

Although this system is adapted to ordinary rails, it is also adapted to a much deeper and vertically stiffer rail, of six, seven, or more inches. And a considerable saving may be made in the weight of the rails, inasmuch as the ordinary rail, being supported on the burr, requires a stiff vertical web, whereas the improved plan being suspended from above, the web is only required to be sufficiently strong to connect the upper and lower tables, as in a bridge girder. A rail six inches deep on this system will weigh less than a five-inch rail on the ordinary system.

The advantages of the system are, 1st, a maximum depth of rail with a minimum of elevation; 2nd, a continuous bearing on timber; 3rd, great lateral stiffness; 4th, a really reversible rail without risk of damage or crystallisation, with the lower table perfect when the upper is worn out; 5th, great safety by reason of the rail being secured without chairs and keys; 6th, diminished cost of maintenance and rapid shifting of rails.

The saving in first cost by this system, by reason of the diminished quantity of timber and the diminished size of scantling, together with the total saving of chairs, will be found equivalent to between three and four hundred pounds per mile of single way. A further saving will be found in the weight of rails and the economy of ballast.

I now come to the wheel. Supposing a railway to be made as nearly perfect as possible with regard to level, joints, gauge, and vertical and lateral stiffness, the destructive process will be found to exist in the crushing of the surface under heavily loaded wheels. As ordinarily made, the wheels, axles, axle boxes, and the springs themselves, are so much rigid dead load. Practically, a driving wheel, at fifty miles per hour, is equivalent to a large Nasmyth's hammer wherever any inequality exists between rails and wheel. The incessant leap of the wheel from po nt to point is a heavy blow.

To obviate this disadvantage, it is de-

* British Association, 1858.

sirable to render the wheel elastic. The improved wheel is so constructed that a continuous hollow in the internal periphery of the tyre is overlapped by a continuous hoop spring, on which the wheel rests, in such a mode that the only dead weight is

Fig. 1.

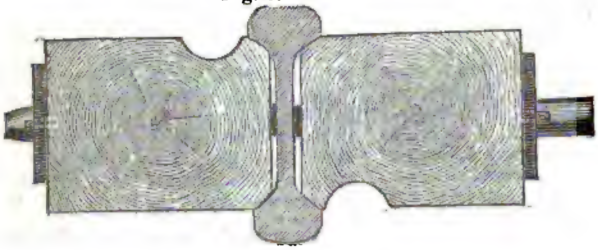
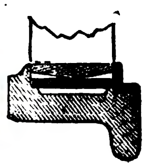


Fig. 3.



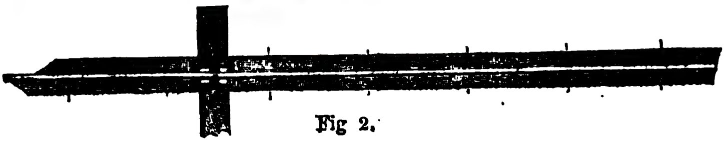


Fig 2.

in the tyre. The tyre is formed with an internal front rib, and when the wheel is forced in upon the spring by cold pressure, a false rib is fixed at the back, and the wheel is secure. The wheel thus treads on an elastic cushion all round the periphery. It cannot be strained on mischievously tight as by shrinking hot, or with the metal in a state of rust. Old worn tyres can thus be taken off and new ones applied by ordinary labourers, without the use of workshops, lathes, or smithies, all the wheels and tyres being prepared to one gauge. The tyres may thus be used of harder, and yet thinner and consequently better, material; and as there are no holes through them they will be much safer, while the number of the parts is lessened by one-half.

These wheels are a practical fact; they have been in use on the Eastern Counties some fifteen months, and six months on the North London, both for wagons and carriages, and they are now applied to a four-coupled locomotive engine for goods trains.

This advantage in saving wear of tyre is found to be considerable, and it is obvious that the saving in the tyre must extend to the rails also. The yielding of the springs induce constant pressure between the tyres and rails, instead of a succession of blows. Ordinary rigid wheels striking the rails in loose chairs cause a large amount of destruction, and are a large element in the cost of maintenance of way.

Fig. 1 is a transverse section of the suspended girder rail with timber bearers, and fig. 2 is a plan of part of such a rail. Fig. 3 is a section of part of a horse-foot wheel tyre, by which the wheel is virtually made to rest upon a continuous spring.

Improvements in Printing Machinery.—Mr. Applegath, whose name is well-known in connection with printing machinery, has recently introduced and patented a set of improvements which are applicable to machines where the type or printing surfaces are fixed on a cylinder, and where the paper is fed into the machines in the form of sheets. Heretofore in such classes of machines the printing rollers have been of larger circumference than the length of the sheets of paper to be printed thereby, by which arrangement comparatively few printing rollers can be ranged round the cylinder carrying the type of printing surfaces. But these improvements consist in reducing the size of the printing cylinders or rollers so that they may be less in circumference than the length of the sheets of paper to be printed, and sometimes two or more feeding apparatuses are applied to each printing cylinder. In this way the number of printing cylinders working with a given diameter of cylinder, and consequently the number of impressions obtained from each revolution of the type cylinder, may be increased. It is preferred that each of the printing rollers or cylinders should be wholly covered with blanket or felt when working with such descriptions of printing machines. In some cases the patentee applies a small roller or rollers with type or printing surfaces thereon, together with proper inking apparatus to each of the printing rollers or cylinders. In this way he is enabled, while printing the main portion of the sheet by the large type or printing cylinder as heretofore, to introduce, for instance, a heading in a different colour, or, in fact, any matter which it is desirable to introduce, and this introduced matter may be changed without interfering with the form on the large printing cylinder.

ON AN EXPANDING PULLEY FOR OBTAINING VARIATIONS IN THE SPEED OF MACHINES WITH FACILITY.

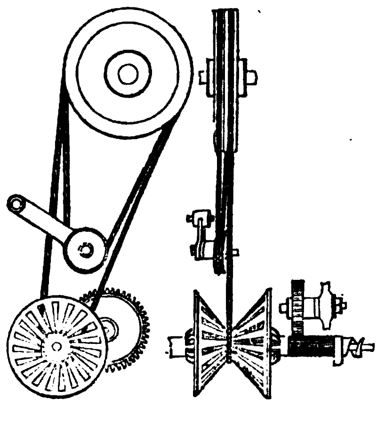
BY JAMES COMBE, OF BELFAST.*

A PRETTY correct idea of this pulley may be formed by supposing two cones cut with radial spaces alternating with solid parts, so that the solid parts in one may slide freely into corresponding spaces in the other, in the direction of a common axis. The sizes of these radial sections are regulated so that when the two cones are put together they form a grooved or V pulley, the diameter of which varies according to the position which the cones occupy with regard to each other. This will be at once apparent by an inspection of the engravings. It will also be seen that any desired amount of variation in size may be got, and this without involving the necessity of occupying a large space. This change in size is made by pressing the one into the other, which can easily be done whether the pulley be in motion or at rest. The value of the property of giving readily any amount of change in size will be made evident by a comparison of the results obtainable by a pair of common cones and a pair of expanders of similar dimensions, and giving the same extremes of speeds.

A range from 1 to 4 in diameter (or more if necessary) is easily obtainable in the expanders, and, supposing the one which drives to have a speed of 80 revolutions per minute, and that it be set at 4 inches diameter, and the one which is driven to be set at 16 inches diameter (the corresponding position), the speed of the latter will be one-fourth of 80, or 20 revolutions per minute.

When the driver is changed to 16 inches in diameter, and the driven to 4 inches, the speed of the driven shaft will be increased to 320 revolutions per minute.

The changes between these extremes (20 and 320) may be of any extent or percentage on the speed, and they can be made as gradually as is desired without stopping. For comparison with this, take a pair of common cones, having the same extreme diameters, and having steps of two inches, which is not more than usual. When the driving strap is changed from the steps on the cones which give the slowest speed (that is, 20 revolutions per minute) to the next steps, which is the smallest change that can be made, the speed of the driven is increased to 34 revolutions per minute, that is, 70 per cent. on the former speed. The change to the next steps makes the speed of the driven 53, and the increase here is 56 per cent. The third change increases it to 80, or 51 per cent.; the next to 120, an increase of 50 per cent.; then to 186, by an increase of 55 per cent.; and, lastly, to 320, by an increase of 72 per cent. All these changes in speed are great, and, although in practice mechanics have become accustomed to them, and don't think of the loss, it is quite clear that a great waste of time must result from not being able to get smaller changes readily. For instance, suppose that a lathe or boring machine has a piece of work in it of a diameter that would require a speed between any of the speeds which the steps of the common cones give, but which will not bear the whole step; it is quite clear that in this case a loss of time and work equal to 50



or 60 per cent. may take place. To get over the difficulty attending the use of common cones, some toolmakers use two pairs of driving pulleys on the counter shaft, which of course doubles the range of the cones; but this is a cumbrous arrangement, and is still very far from giving what is necessary or desirable. There are many machines in which a variation of speed is desirable, and would be used if it could be got readily; but there is often such a loss of time involved in making a change that very much slower speeds are used rather than take the trouble or incur the delay of making that change. The common cones referred to are not by any means an extreme case; on the contrary, it is quite common to make the steps even greater, and, if the number of steps be less and the extent of the range smaller, there is of course a corresponding diminution in the adaptability of the machine to different purposes.

The expanding pulley was first brought out for the purpose of giving the varying

* British Association, 1858.

motion to the bobbins in flax and tow roving frames, to which it is applicable with great advantages, from the accuracy of its action and the small space which it occupies. By its use a very simple and correctly working machine is got, capable of making bobbins either in the ordinary way or in cops. It is equally applicable to the heaviest and the lightest frames.

The cop is from a tow roving frame, and is made of rove weighing 1 lea (or 300 yards) to the lb. The bobbin is filled with flax rove of 40 leas (or 12,000 yards) to the lb.

On the machines on which this bobbin and cop were filled only one expander is used, and the band is kept at the necessary tension either by making the expander swing in a frame or by the use of a stretching pulley.

A very simple mode of applying a stretching pulley is to make the pulley, which does not vary, with two grooves or Vs, and pass the band twice round it, putting the expander in one fold, and the stretching pulley in the other. These arrangements are applicable to many other purposes. Where two expanders are used, one to drive the other, it is not necessary to have any stretching pulley, but simply to connect one or both sides of each pulley with levers, so that they may be moved simultaneously as required.

FLOATING DRY DOCKS.

DESCRIPTION OF A FLOATING DRY DOCK DESIGNED IN 1836 FOR A SOUTH AMERICAN GOVERNMENT, INTENDED TO BE MOORED IN DEEP WATER, AND RIDE WITH A SHIP OF WAR IN IT WITH SAFETY DURING ORDINARY GALES.

BY GEORGE BAYLEY, ESQ.*

The rapid increase of iron steamers and ships in long foreign voyages, and the necessity for frequent cleaning of the bottoms from marine vegetation, &c., seems to require additional facilities for performing these necessary operations, and renewing the coating of paint or other protective covering abroad with despatch and economy.

The existing dry docks abroad are many of them situated where, there being no rise or fall of tide, the water has to be emptied out of the dock either by manual labour or machinery, and, from the extremely faulty construction and execution of the work, it not unfrequently occurs that constant baling or pumping is required during the whole time the ship is in dock. Of course, this involves great additional expense; and besides, such docks are commonly so extremely damp that paint does not always dry well in them.

The port, or rather open roadstead, in which it was proposed to place the floating dock, whose model is submitted to the Association, had a rise of tide of about 6 feet. The shore consisted of a fine sand, frequently shifting with changes of wind, &c., to the extent of many feet in depth, so that the difficulties presenting themselves to the successful construction and subsequent use of a dry dock seemed too insurmountable, excepting at a cost beyond the means which the Government had at its disposal.

A patent slip way had been suggested, and the Government were disposed to adopt it; but then the danger of being sometimes sanded up so as to be useless, and at other times scoured away so as to be unsafe, were serious objections to its adoption, to say nothing of the objections to the use of a slip way for long and heavy ships.

These considerations led to the suggestion of a floating dock, and, to meet the peculiarities of the place, it was proposed to construct the dock so that it could be immersed or sunk down to any depth that might be required to admit the ships of various classes, and be strong enough to ride with them without straining the ship.

Three things had to be combined—strength, rigidity, and buoyancy. The needful strength and rigidity were to be secured by a very simple system of bracing and trussing, and the whole framing covered with planking well secured and made water-tight. This space was subdivided longitudinally and transversely, so as to obviate any risk from the rushing of the water from side to side or from end to end of the dock; and, at the same time, these longitudinal and transverse partitions would add to the strength and rigidity of the entire fabric.

A transverse section of the dock would show that the floor of the dock is a framed beam consisting of two tie pieces about 4 feet apart, with Queen posts in the centre, under the ground or lower tier of keel blocks, with tie bolts introduced where necessary. The sectional area must be proportioned to the entire weight of the dock with the ship, so that, if desired, it may float with its upper internal surface above the level of its external waters. The angular or rectangular space between the outer and inner planking of the sides must be of sufficient volume to allow the dock to be sunk to any required depth to receive the ship.

The dock itself must be ballasted with

* British Association, 1858.

sufficient weight to render it specifically heavier than water, in order that it may be readily sunk to the required depth.

It was proposed to have an engine fixed to pump out the water from the subdivisions (or what I may perhaps be allowed to term the flotation space) between the inner and outer casing or planking, and also to drive saws and any other tools that may be required for carrying on the repairs.

At the time when the dock was designed, wood was the material proposed to be used; but now it would be desirable to construct such docks of iron, which is so peculiarly suited to meet all the requirements of such structures as to strength, rigidity, and buoyancy, at less cost than timber under almost every combination of circumstances.

The sectional or pontoon docks of America are nearly identical as to their buoyancy, but they can only be used in still water.

The ordinary floating dock has been long in use both in Great Britain and abroad, but from its imperfect construction it was so flexible that ships were frequently severely strained and injured by the twisting and bending of the dock.

A very ingenious modification of the sectional dock is used at Lyons, for cleaning and repairing the iron steamboats plying upon the Rhone. They are simply square punts, with a portion cut out on two of their sides, and fitted to the form of the bottom of the vessel. They are hauled under the vessel and then pumped out, when they lift the vessel completely out of the water, so that all parts of the bottom can be got at, and repairs of any kind effected. Such pontoons might be more generally used with advantage for lifting iron ships out of the water in lakes and still water.

It is unnecessary to enter into details that will at once present themselves to any one constructing a floating dock on the plan suggested—local circumstances and requirements will determine many of the questions that may arise.

The peculiar advantage of the kind of dock now suggested is its adaptation to places where from local circumstances it is difficult, if not impossible, to build secure and substantial dry docks on the shore, excepting at such a cost as would preclude their erection—for instance, in the harbour of Malta, and others in the Mediterranean, where at present the vessels are hove down to perform the repairs to the bottoms. This is a simple operation and comparatively unattended with danger to small vessels, but large ships are all more or less strained by the operation.

ON THE CONSTRUCTION OF FLOATING AND FIXED SHOT-PROOF BATTERIES.

Mr. G. Rennie read a paper on the above subject at the Leeds Meeting of the British Association. It contained but little more than a *resumé* of what has lately been done. Many experiments of solid and hollow shot fired from 68lb. guns have, he said, been made recently at Woolwich and Portsmouth, with unfavourable results. These results led him to think that little or no success had hitherto been attained. He therefore proposed to use inclined or curved surfaces, instead of flat or point-blank surfaces, as was illustrated in the models exhibited.* One of these was a floating battery, or man-of-war, having its sides cased with iron plates with curved surfaces; the other of a fixed or floating battery, also with curved surfaces. He claimed no other originality for this idea than in the curved forms of the plates. Mr. Rennie also exhibited various specimens of felt which had been handed to him by General Sir Charles Shaw, and several of which had been penetrated to a limited extent by rifle balls.

Capt. Fishbourne said, in the discussion which followed the paper, he was of opinion that with such an extreme weight of iron it would be impracticable to build sea-going ships. The rapidity of the motion of the *Agamemnon*, when she had the cable on board, had the effect of nearly disintegrating the ship, and she must have had an enormous strain upon her when she suffered in the way that had been already publicly described. The principle advocated by Mr. Rennie could only, he was afraid, be used in exceptional cases.

Mr. Scott Russell said the French Government were carrying on a series of experiments, as were also the English Government; but, although he had been informed of the nature of these experiments, he was not at liberty at present to communicate them. The English Government were adopting a very wise and judicious course — they were making their experiments now before they built their ships. The point with which, as mechanical men, they had to do, was whether wooden vessels of war were equal to the work of iron vessels. If the English Government found that war ships would be more advantageously constructed with shot-proof sides and otherwise protected with iron, then he had no doubt that engineers and ship-builders would be found

* In this matter Mr. Rennie has been completely superseded by Mr. J. P. Drake, whose plans for using inclined iron ship and other defences were laid before us a year or two since, and before the Government much earlier.—Eds. M. M.

who would both get the material and construct the vessel in a proper manner. And he was also of opinion, that it was possible to make ships with shot-proof sides which would have also good weatherly qualities.

ON THE CONSTRUCTION OF TELEGRAPH CABLES.

BY J. MACINTOSH.*

In the ordinary process of expressing the gutta percha through dies in a fluid state, the covered wire as it issues from the die is caused to pass into a long trough containing water, for the purpose of setting it. Each coating goes through the same process; and great difficulty is found in causing the perfect union of the different coatings, which renders the insulation liable to leakage. In order to obviate this difficulty, I coat the wire with gutta percha by means of rollers mounted on parallel axes, and revolving in contact with each other. Each of these rollers is grooved in its periphery, and these grooves meet to form an eye the size of the covering desired. Against these rollers are placed hoppers, in which gutta percha or india rubber is placed in the state in which it comes from the masticator. The india rubber or gutta percha enters and fills up the grooves of the rollers, and where they come together the gutta percha or india rubber in the grooves is brought together in one piece enclosing the conducting wire; the longitudinal strength and protection are obtained by embedding fibres of hemp, flax, or cotton in an outer layer of insulating material; this is done with great pressure. This covering is subsequently passed through a bath of sulphuric acid in about twenty seconds, which enables it to resist tropical heat, and affords quite sufficient protection against ill-usage. The shore ends of the cable, or for shallow water, are protected with strong wire.

In place of sulphuric acid chloride of sulphur might be used, mixed with a solvent, say sulphuret of carbon, to which from two to four per cent. of chloride of sulphur has been added; the covered wire is then passed through this mixture. The speed at which the covered wire passes through the liquid is so regulated as to remain therein about three seconds; this process closing up the pores thoroughly and rendering it much less likely to be injured by heat or abrasion, and effectualy preventing the decomposition of the gutta percha or india rubber.

* British Association, 1858.

NORTH COUNTRY STEAM COAL FOR THE ROYAL NAVY.

The officers appointed by the Admiralty to inquire into the relative merits of the Welch and North Country coals for the steam ships of the Royal Navy, and to decide the question which has recently arisen respecting them, have made their report. We are not at liberty to publish this at present—how much longer shall we have to repeat this phrase, which implies so much unjustifiable secrecy on the part of public servants?—but we may, we believe, state that their decision is in favour of the North Country coal, which they pronounce not only equal but superior to the Welch. It can, they say, be readily burned without smoke, and with less detriment to the boiler tubes, &c., than results from the use of the Welch coal The very highest opinion is expressed by the Admiralty referees of Mr. Charles Wye Williams's furnace at Newcastle, which they pronounce to be surprisingly perfect in its operation, and attended by an important reduction in the amount of fuel consumed, as compared with ordinary furnaces. We have much pleasure in finding these facts so clearly confirmed by gentlemen who have no personal interest in the matter; and we hope Mr. Williams will consider their decision as an ample reply to the attacks of those mercenary and unscrupulous persons who, while turning his inventions to their own profit, treat him with the utmost disrespect and indignity. Our regret is that such persons can find any British journalist willing to insert their baseless and vulgar calumnies.

ON A PROPOSED FLOATING LIGHTHOUSE.

BY JOSEPH JOHN MURPHY.*

The object of this invention is to prevent as much as possible the oscillation produced by the waves. Mr. Murphy proposes to do this by basing the lighthouse on an inverted air-tight cylindrical caisson containing air, and floating exactly in the manner of a gas-holder; so that the waves may rise and fall *inside* the structure, and consequently not have a tendency to heave it up and down. It would obviously greatly promote the safety of navigation were we able to carry into effect Mr. Herbert's project of anchoring steady floating lights in the middle of the Irish and British Channels; and the same construction will probably be applicable to various other purposes, especially floating batteries for coast defence.

* British Association, 1858.

TELEGRAPHIC CABLES.

To the Editors of the Mechanics' Magazine.

Gentlemen,—In my first paper, published in your columns thirteen years ago, I proposed that submarine electric cables should be enclosed in metallic tubes—gutta percha was then unknown—and about one year later, in one of my published papers, I suggested that an electric cable for the Atlantic should consist of six copper wires twisted and "drawn" together so as to form a solid wire rope. The subsequent adoption of wires insulated with gutta percha lead to the belief that a similar plan would answer for ocean telegraphs. The hopes of success have, however, been disappointed, and it has at length been proved, that the mode of insulating wires hitherto adopted is defective in principle. Not only are such wires bad conductors of electricity, but there is also a difficulty in getting rid of each charge. Mr. Hearder thinks that he has discovered a remedy: he proposes to cover the wire with some soft fibrous substance, and then to surround the whole with gutta percha. I will venture to predict that a cable constructed on that principle would not answer better than that which is now extended on the bed of the Atlantic, by the reason that the enormous pressure of water in great depths would convert the fibrous material into a substance almost as dense as gutta percha itself. Until the pressure of water is entirely removed from the conducting wire, the same difficulty in transmitting electricity, and in getting rid of each charge, will exist. The following is a plan for a new Atlantic cable which I have been occupied during several months in maturing. The six copper wires having been drawn together, as above described, into a solid rope, I would wind it round a slender mandril, so that it would assume an elongated spiral form. This would prevent any sudden strain to which the cable might be subjected from injuring the conductor, the spiral form allowing of its being stretched without being strained; this wire I would place in a gutta-percha tube, the internal diameter of which would be half an inch, and the external diameter one inch and a-half. Such a tube would never collapse, but I would surround it with hemp. Instead of winding the yarn in a spiral direction, I would weave or plait it around the tube, so that there would be no danger of its uncoiling. Various substances might be used for protecting the hemp; perhaps marine glue would answer as well as any. I would then enclose the whole in a vulcanized india-rubber tube, of at least one quarter of an inch in thickness, this tube being connected to the cable by means of thick varnish. Lastly, I would cover the external tube with several coats of hard spirit varnish, capable of resisting both heat and moisture.

The conducting wire might be protected from oxydization by means of a thin coating of gold; two ounces of that metal spread over each mile of wire would not only effectually protect it, but would also greatly add to its strength. This effect of gold on copper has been long since known, although not hitherto adopted for telegraphic wires.

The cost of this tubular cable for the Atlantic would be at least one million sterling; but, instead of constructing a cable with only one wire, I would suggest that three or four tubes, each containing one wire, should be fastened together; the space between the tubes being filled with gutta percha. That such a cable would cost a large amount, I am aware; but, as it would establish, effectually, an instantaneous communication between the Old and the New World, that amount would be small if compared with the magnitude of the object attained.

I am, Gentlemen, yours, &c.,

John de la Haye.

New Bailey-street, Salford, Manchester, October 4th, 1858.

To the Editors of the Mechanics' Magazine.

Gentlemen,—Although I have not been so fortunate as to obtain your assent to all that I have advanced in reference to errors unavoidable in some measure, perhaps, to such an undertaking as the Atlantic telegraph—your allusion being, I should imagine, more to incidental matter than to scientific topics—yet I am sure you will agree with me in this opinion at least, that to refuse admission in your pages to all ideas with which you cannot coincide would be to set up an individual standard in accordance rather with an autocratic spirit than with the republican character of the commonwealth of science.

Your correspondent Mr. Pitter appears to be doubtful about the permanent insulating qualities of gutta percha, and asks whether it will not get saturated with water in a depth of the ocean of two miles, and under a pressure equal to about two tons on the inch. The correspondent of the morning papers whose observations have been in part quoted by you is also of opinion that, although the existence of minute and perfect shells does not disprove the fact "that a great *weight* comes upon the bottom of the ocean and *whatever rests there*, because the pressure of water is equal inside and out, yet in the case of gutta percha it is not so, and the water pressing with immense external force would

penetrate in many places where the guard hemp was at all injured, and so gradually permeate the substance of the gutta percha as to reach the copper wire, and seriously weaken its conducting powers." This is a very curious error for a gentleman so accredited and of such parts to fall into; but tact or acumen appears to be something which learning fails to impart, but which learning is very apt to think it can do without. Without staying to notice the words which I have put in italics, or to ask what there is in a hemp covering that could possibly *protect* a gutta percha one, I would merely remark, that, if either is waterproof under ordinary circumstances, pressure would rather consolidate and make them more so.

I will illustrate this with an experiment I once instituted. I made between two pieces of lead a joint, which being both air and water tight, the pieces adhered together. I then submitted them to a water pressure equal to an ocean depth of twelve miles. The two pieces were not separated by it, nor did I suppose they would, but I did anticipate a firmer union between them than before, but this also did not take place. All apprehensions, then, of the failure of an electric cable from this cause may be dismissed; for the molecular forces concerned in resisting the intrusion of water under ordinary circumstances, although unable, under immense pressure, to resist the compression, and, in some cases, the permanent condensation of substances, will not be impaired but rather strengthened thereby, to resist capillary permeation, and probably even in some higher ratio than in simple proportion thereto, provided only that there is no unbalanced force on any side. Hence we can conceive how, of two substances equally impervious to water in the ordinary state of things, the more compressible, such as gutta percha, should be more impermeable than the comparatively incompressible, such as stone, if both were placed under an immense pressure of water. Wood certainly becomes thoroughly saturated under such circumstances, but then it is naturally permeable by water, and yet no doubt there are portions of its organization proof against it. I may also state, as not wholly irrelevant to the subject, that I never found joints or pores permeable to air under circumstances of unbalanced pressure that were not permeable to water also.

I am, Gentlemen, yours, &c.,
BENJAMIN CHEVERTON.

MEMORANDA ON MILITARY ARMS.

BY CAPTAIN NORTON.

To the Editors of the Mechanics' Magazine.

GENTLEMEN,—I beg to hand you the enclosed memoranda, which I shall be happy to see inserted in the *Mechanics' Magazine* at your earliest convenience.

I am, Gentlemen, yours, &c.,
J. NORTON.

"OBSERVATIONS ON MUSKETS, RIFLES, AND PROJECTILES, BY HENRY WILKINSON, M.R.A.S., M.S.A."

"*Wilkinson's System*, page 54.

"The character of this system consists, as in the Minié, of the principle, that the action of the gases produced by the ignition of the powder on the projectile is sufficient to cause it to fill the grooves of the rifle; and also in the peculiar construction of the projectile, which differs thoroughly from every other, in being not hollow but solid, and having two deep angular grooves in the cylindrical part.

"But, since the projectile has no hollow in the base, the action of the powder upon it must be different from the Minié system, inasmuch as it must drive the ring-formed cylindrical part into and upon the conical fore-end, and so accomplish the filling of the grooves; but this is only possible providing the conical part of the projectile has the necessary weight.

"By the action of the powder-gases on the base of the projectile, the oblique surfaces of the cylinder are driven wedge-like into the rings above them, through which the expansion sideways is accomplished. This, however, will only happen if the oblique surfaces, or wedges, are in proportion to the depth of the grooves of the rifle, and if the strength of the explosion is not able instantaneously to overcome the '*vis inertiæ*' of the conical or heaviest part of the projectile. From this it is clear that the length of the wedges must be regulated by the depth of the grooves of the rifle, and that the weight of the conical fore part must be increased in proportion to the strength of the charge."

I have found, as far back as the year 1824, that a *solid* elongated leaden shot, from two to three diameters of the bore of of the rifle in length, will expand by the force of the explosion into the grooves of the rifle when the charge is what may be called the service charge. Therefore, I consider that circular grooves on the cylindrical part of the projectile are not necessary to produce "self-expansion," but I

consider them very useful for holding the lubricating matter. J. N.

"*Easy-loading, self-expanding, solid bullet.*" *Never before obtained.* page 36.

My rifle shells, first used by me from a rifle musket bore at Enniskillen in the year 1824, had projections on them so as to fit *easily* into the corresponding grooves of the rifle barrel. The base of this shell was *solid* for about one-third the length of the shell. After the shell was fired into a bank of soft clay, it was found to have expanded in its *solid* base so that it could not again be inserted into the muzzle of the rifle easily, or even with considerable force being applied.

J. N.

"TETONS."

In the first page of notes in Dahlgren's book on shells and shellguns, is the following:—"Among these may be mentioned the experiments in France upon the shell-gun of 22 cent. bored to a 30-pounder; this is rifled with two grooves, 0 in. ·275 wide, 0 in. ·039 deep, and a length of 19¾ feet in revolution of the spiral. The projectile weighs 54½ pounds, and has a cylindro-conic form. On its surface, at the poles of a given diameter, are two rounded protuberances or nipples (tetons), with an elliptical base. These are to enter the two grooves in the bore, which they may be said to touch at but a single point, and thus the desired rotatory movement is imparted to the projectile. It is said that ranges exceeding 5,400 yards have been obtained with this ordnance, the elevation being 15° and the charge 7¾ lbs." Fig. 3, page 2 of my pamphlet on projectiles, Hebert, 88, Cheapside, two well-rounded "tetons" are represented. This shot or shell I had repeatedly fired from the service two-grooved rifle, with unerring precision and effect. In the *Field* of the 19th inst., it is said, on the authority of a letter from Calpee, India, that the rebel Sepoys cast their cannon on a core of prepared clay. I have taken out a patent for casting cannon on a prepared rifle core of clay or sand, or rather the usual composition of a core for iron castings.

J. N.

Rosherville, 22nd Sept.

MEMORANDUM FOR MR. J. POAD DRAKE.

In the year 1823, when I was trying to make an expanding elongated shot for the smooth-bore musket of that day, borrowing my ideas from the expanding hollow lotus base of the Malay tube arrow, in order to strengthen the hollow portion of my iron shot, and to make it fit air-tight in the barrel, and at the same time go down by the force of the ramrod without difficulty, I rolled round it thread, after the manner described by Mr. Drake. I explained and showed my shot thus prepared to General Sir Herbert Taylor, Secretary at the time to the Duke of York, Commander-in-Chief. Mr. Rigby, the well-known gunmaker of Dublin, used, to my knowledge, elongated shot prepared in the same manner as that of Mr. Drake's several years ago. I was not quite satisfied with the plan of rolling thread of any kind around the cylindrical part of the shot, and when, after numerous trials, I found that I could *cast* my leaden elongated shot into a *stays* of calico, paper, or linen, which stays may be ready *rifled* in a mould or die, I then resolved to take out a patent for the process.

J. N.

N.B.—My elongated shot, with its close-fitting calico or linen stays, is a shade larger in its diameter than the present service or Enfield rifle shot; its stays does not *rub* off, either in ramming home, or in its passage out through the barrel. The present service or Enfield cartridge is liable to have its surrounding greased paper rubbed off in ramming home, or in its passage out through the barrel.

J. N.

A NEW COLOURING MATTER.—In a communication addressed to the Academy of Sciences, M. Verdeil announces the discovery of a green substance extracted from the flowers of plants, and quite distinct from the green of their leaves. It is well known that the extremities of the petals of a flower, by which they adhere to the calyx, are white; in buds they are whiter still, and particularly in the flower of the thistle. If this white part be boiled in water, and then subjected to pressure, the juice obtained will be colourless, and remain so in contact with the air; but, if a few drops of a solution of carbonate of soda or limewater be added, the surface of the liquid will gradually assume a green colour, and if it be well shaken the whole will become dark green. If there be an excess of alkali the green will acquire a yellowish tint; in that case a little acetic acid will transform it into a bluish green. Alum, the acetate of lead, and the deutoxide of tin precipitate fine green lakes of different shades from the liquid. These lakes, being separated by filtration and dried, maintain their colour and resist the influence of light. The protoxide of tin forms a yellow precipitate, and also changes to yellow the green lakes obtained with alum and the acetate of lead.

THE CABLE AND THE COMET.

Mr. Robert Howard of the Old Jewry writes:—

In looking over the curious effusions of Thomas the Rymer, I was amused by the following prediction, which is really so precise and strange—shadowing, as it appears to me, railways and the electric telegraph—that I thought you might feel inclined to give it a corner in your paper as a literary curiosity.—Qy. Does the *Portent* alluded to mean the comet?

When yoked cloud and snorting steed
Devour ye earth where e'er it lead;
When lands and lands are bridged together
By flames as fast as bands of leather;
When turns the sun mechanical,
To paint ye glass, or print ye wall,
Then will a mighty Portent come,
To waste the world, and leave it dumb.
What time ye moon shall fill her horn
Beneath ye lustful Capricorn,
E're nineteen hundred years be told,
Since rose the God-child—prophet knoll'd.
Be heedful then, Omega's frown,
Shall haunt—saith Thomas of Erceldowne.

Paints and Paper Hangings.—M. Kuhlmann, who was the first to apply sulphate of barytes to house painting in France, a few days ago read a paper on the subject to the Academy of Sciences. Sulphate of barytes is white, and is preferable both to white lead and to oxyde of zinc, not only on account of its durability but also because it produces no injurious effects upon the health of the workmen. It may be reduced to the form of dry cakes like white lead, but it is preferable to keep it in the state of a paste, because, when once dry, it cannot be again reduced so easily to a fine powder, such as it was when first precipitated. It is used with great advantage in the manufacture of paper hangings, and has been successfully applied to oil painting, a coating of this paint being much more durable than any other known. M. Kuhlmann further expressed his belief that it would not be impossible to obtain artificial ultramarine from barytes.

The Comet and its Observer.—Some weeks since a very ill-spelt letter, dated "Sheerness," and signed "C. Morens," was published in a conspicuous position in the *Times*. The writer described, in his own remarkable way, his discovery of the comet that every one is now observing with interest, and the manner in which, by the aid of two sticks, he obtained the bearings of the visitor. The writer is a coastguardsman in the Isle of Sheppy, and therefore, as his letter implied, much accustomed to nocturnal aspects and phenomena. Although his letter evinced a profound want of the common rudiments of education, yet it afforded manifest evidences of natural sagacity; and in recognition of these Professor Airy has considerately sent the writer a set of elegant volumes from the Royal Astronomical Society. We wish Mr. Morens much success in his study of them.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

Milles, R. F. *Improvements in omnibuses.* Dated Feb. 24, 1858. (No. 371.)

The object here is the combination of elegance with utility, giving greater room and comfort to the passengers, who are enabled to sit in a circle, or otherwise, and one passenger to sit in a recess in the front, combined with greater width, attained by carrying out the sides of the omnibuses with circular bent timber, and doing away with the front pillar and scroll. The windows are made of bent glass carried over the hind wheels. It also relates to the construction of front rockers made of circular bent iron or other metal. Also to the cant rails and side rails which are carried round with bent timber to the front boot pillars, or continued round the front of the omnibus. The dumb springs are made with branches at the back end, and constructed to give better lock to the omnibus in turning. The back ends of futchells are also superseded, and the perch bolt made to work at the back of the bed: the wheel plate is made to work out of centre, and is of different construction in front, and the front steps are larger.

Applegath, A. *Improvements in printing machinery.* Dated Feb. 24, 1858. (No. 372.)

This invention is described at p. 346 of this Number.

Arnold, J. *Improvements in metallic pistons.* Dated Feb. 25, 1858. (No. 374.)

Here a ring is made deep enough to form the two packing rings; it is then cut obliquely to form two rings, which are each cut at the deepest side, to allow them to be expanded against the sides of the cylinder. The two rings are arranged between the two plates of the piston, so that the deep part of one ring is over the shallow part of the other, and a spring ring is placed inside them to force them outwards.

Barnes, J. B., and J. Loach. *Certain improvements in apparatus for descending and ascending the shafts of mines or other deep pits the descent and ascent of which imperils the lives of the miners or others employed therein.* Dated Feb. 25, 1858. (No. 375.)

This consists of a circular frame and conical roof, connected with standards, to which the bottom frame or rim is attached. Within the standards a cage is placed, which is supported by the hook by which the skip is held in suspension. Connected with the top frame, from below the roof, expanding radial arms or buffers are fixed, and at the bottom radial levers are fixed, so that when the chain is destroyed the weight of the inner cage with its occupants not only presses on the radial levers, causing them to extend out, but simultaneously allows the radial arms or buffers to extend also, thus making the skip to jam and hold itself in the pit shaft.

Templeman, J. *Improvements in the manufacture or production of artificial fuel.* Dated Feb. 25, 1858. (No. 376.)

This relates to fuel in use for lighting fires. It is composed of saw-dust, or reduced vegetable matter of various kinds, mixed with powdered resin or resinous matter of any cheap kind.

Middleton, S. *Improvements in the uniting or seaming articles of leather, and in the apparatus connected therewith.* Dated Feb. 25, 1858, (No. 378.)

The patentee claims the method of uniting pieces of leather by metal wire passed through in an oblique or spiral coil, and then tightened as much as needed; also by metal pegs with indented, or jagged, or barbed surfaces.

NEWTON, A. V. *Improved machinery for grinding and polishing glass, stone, metal, and other substances.* (A communication.) Dated Feb. 25, 1858. (No. 380.)

This relates to producing a compound rotary motion, either of the grinding and polishing surface, or of the surface being ground or polished, through the agency of friction, and a simple rotary motion that is imparted to the opposed surface.

MORISON, J., sen., and J., jun. *Improvements in Jacquard apparatus used in weaving.* Dated Feb. 26, 1858. (No. 382.)

This relates to the "double lift" Jacquard apparatus. In this each mail or eye is connected by separate threads to two "tails" or knot cords, and on one thread being lifted the other is thrown slack, which makes it liable to be improperly acted upon by the Jacquard needle when it is required to be lifted at the next shed. This defect is remedied by attaching small weights to each tail between the point where the several mail threads are attached to it, and the point where the needles act upon it, so as to insure the tightness of the tails under all circumstances. It also consists in connecting the two lift-boards to opposite ends of a lever on a rocking shaft or centre, so as to act as counterpoises to each other. Also in a mode of working the Jacquard barrel, wherein the barrel is carried in a frame capable of sliding horizontally, the frame being shifted by a groove or slot, portions of which are inclined in opposite directions, and which acts on a pulley carried by the frame, and in the case of power looms may be attached or connected to the vertical rod actuating the Jacquard apparatus.

SMITH, W. C. *Improvements in the manufacture of envelopes for letters and other purposes.* (A communication.) Dated Feb. 26, 1858. (No. 383.)

The patentee claims, 1. Forming a tongue to one of the flaps of envelopes, and arranging it so that when the envelope is folded it shall overlap some part of the ends of the other three flaps, and fasten them together as well as to itself with adhesive matter. 2. Making the cutter or steel knife with a curved indentation corresponding to the shape of the tongue, so as to prodnce the paper, at one cutting, of the proper shape, with the neck and projecting sides of the tongue, and a shoulder on each side. 3. Preparing and arranging paper to serve as an envelope and writing paper in one piece. 4. Perforating the tongues or parts of the paper to which the outer fastening or seal to envelopes or letters is applied.

CHADWICK, W. *Improvements in ventilators.* Dated Feb. 25, 1858. (No. 384.)

This consists in a mode of constructing and applying revolving spiral vanes or worms to the chimneys, flues, or roofs of dwelling houses, &c., for improving the ventilation.

KNOTT, J. *An improved feeding bottle.* Dated Feb. 27, 1858. (No. 388.)

This feeding bottle appears to us to be precisely the same as that patented by Mr. Edwards, and described at p. 628, of No. 1820.

NURSE, D., R., and G. *Improvements in coating metals, and in the apparatus connected therewith.* Dated Feb. 27, 1858. (No. 390.)

These refer mainly to coating iron, &c., with tin, or with an alloy of tin and lead, by using a hot chamber, in substitution of the employment of grease, or grease pots, in the finishing process; and the same is applicable in the zincing or galvanising of metals.

GALLI, L. *A process of superseding wood engraving, which he calls gallitypy.* Dated Feb. 27, 1858. (No. 391.)

The patentee claims, 1. The preparation of plates of wood, stone, or other hard material, by laying over the plates a mixture of soft white chalk and paste, and drawing and engraving the illustrated subject with sharp-pointed instruments on the said plates. 2. Using any other white salt or oxide in lieu of the chalk for preparing the mixture, and any other fecula in lieu of wheat meal for making the paste, and also any other gum, resin, or beeswax to mix with the material, and substituting glue for paste. 3. Making negative plates in the same way.

HENRY, M. *Improvements in electro-magnetic motors.* (A communication.) Dated Feb. 27, 1858. (No. 393.)

The distinguishing features here are, 1. Electro-magnets caused to roll or move on other electro-magnets. 2. The reciprocal action of a certain number of electro-magnets so contrived as to act until they come in contact, and that each magnet may commence to act on its crank when at an angle of 45°, and continue acting until it has attained an angle of 90°. 3. A mode of distributing the currents, by a metal rod free to move in a bath composed of mercury and distilled water. 4. A counter current to drive off the "coercitive force" (which remarkable term is applied, we presume, to what is universally known as "residual magnetism.")

GILBEE, W. A. *An improved union joint for gas, water, and steam pipes, also applicable to the branch pipes of fire-engines or pumps.* (A communication.) Dated Feb. 27, 1858. (No. 394.)

This consists in constructing the upper pipe of union joints with, and applying thereto, a grooved flange and a pressure collar with a grooved wedge flange, and in forming the lower pipe of the joint with lugs, and with an elastic bearing, so that, when the flanges are placed under the projecting lugs in the lower pipe of the joint, by giving a partial turn to the nut of the collar an air or water tight junction is obtained.

NEWEY, J. G. and W. M. *Improvements in fastenings, especially for or applicable to wearing apparel and purposes where a spring connexion or adjustment is desirable, in arranging for sale and packing fastenings and ornaments, and in ornaments for personal wear.* Dated Mar. 1, 1858. (No. 397.)

This consists in the use as a substitute for the ordinary eye used in hooks and eyes of a metallic loop or bar, either straight or curved, having a needle hole or orifice at each end, by which a close and secure connexion is obtained on inserting the hook. Also, in the use of stamped wood in the manufacture of bracelets, &c. Also, in certain spring catches or clasps formed of a single piece of metal. And finally, in arrangements for packing ornaments and arranging them for sale.

SCHUTTENBACH, A. V. *An improvement in treating fatty and oily matters.* Dated Mar. 1, 1858. (No. 399.)

This is an improvement on an invention patented 22nd May, 1857, and consists in omitting the paraffine there used.

FIELD, J. K. *Improvements in lamps.* (A communication.) Dated Mar. 1, 1858. (No. 401.)

The case of the lamp is a tube (which may resemble a candle) closed at both ends. It contains the oil, &c., with which the lamp is fed. Immediately under the bottom of it is a shallow egg-shaped vessel, the lower end of which is made of platina. At its upper end this vessel communicates by two fine apertures with the reservoir above, and through these apertures the oil, etc., descends, and falling on the platina bottom, which is heated, is converted into vapour. This passes away by a pipe proceeding up from the top of the lower vessel or generator into the reservoir (or case), and the vapour escapes and bubbles up through the liquid in the reservoir. At the top of the reservoir a jet is placed, and from this the vapour escapes and is burnt like ordinary coal gas. From the top of the reservoir a small pipe proceeds, and terminates in a jet under the platina bottom of the generator, and at this jet a small quantity of the

vapour is burnt, and generates a constant supply for the main burner.

PLATT, H. M. *Improvements in ploughing and tilling land.* Dated Mar. 1, 1858. (No. 403.)

This invention was described and illustrated at p. 241 of No. 1831, for Sept. 11th, 1858.

NEWTON, W. E. *Improved machinery for removing burrs and other extraneous substances from wool or skins.* (A communication.) Dated Mar. 1, 1858. (No. 404.)

This relates to a machine for burring and cleaning wool in the pelts or skins, by clamping them between feeding rollers, and presenting them to the action of a revolving cylinder armed with teeth to comb out the fibre whilst the beaters knock off the burrs and other matters, the pelt being held by the feeding rollers, to prevent all danger of its being drawn into the cleaning cylinder.

NEWTON, W. E. *Improvements in the treatment or preparation of maize or Indian corn, previous to grinding the same into flour.* (A communication.) Dated Mar. 1, 1858. (No. 405.)

This comprises the following: 1st, the analytical separation and simultaneous isolation of the component parts of Indian corn, so as to obtain separately the flour, the semolina, and the coarse product. 2nd, the imbibition of the maize by cold water, the brushing or wiping of the grain, the grinding, the sifting, and the drying. 3rd, a manner of dressing the mill stones by cuts proceeding from the centre to the circumference. 4th, a new product, which is the result of the analytical principle and process explained above. 5th, obtaining more nutritious product than by the old process.

BILLING, J. *An improved throat and door for chimneys and flues.* Dated Mar. 1, 1858. (No. 406.)

The patentee constructs a double conical throat or frame of iron or pottery, which he fixes into the chimney. A door is made to fit into this throat, and is connected to it by a joint, and provided with a rod or handle by which it can be raised or lowered.

SKELLY, J. *Improvements in carriage springs.* Dated Mar. 2, 1858. (No. 407.)

These consist, 1st, in using a single top and bottom leaf, which meet at their extremities, and are united. These leaves taper from the middle to their ends, and are curved in proportion to their required strength, and between them a centre longitudinal metal bar passes from end to end, with one extremity projecting, and having a screw thread upon it to receive a nut for regulating the elasticity of the leaves or springs. 2nd, in making one spring answer the purpose of two. The invention includes modifications, and cannot be completely described without engravings.

BURCUMSHAW, J. *Improvements in machinery for dressing lace made of silk, cotton, or other material.* Dated Mar. 2, 1858. (No. 408.)

The inventor employs a metallic table which he heats by steam. The lace is carried over it during the dressing, and when in contact with the table receives pressure applied by machinery. The lace on receiving the hot pressure becomes partially dried, and from the table, throughout the length and width of the machine, are led heated pipes. The lace passes from the bed directly over these pipes; and immediately above the lace is a fan which wafts the hot air emitted from the pipes, and the lace is dried.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

BOYDELL, J. *Improvements in locomotive carriages.* Dated Feb. 23, 1858. (No. 356.)

This is applicable to locomotive carriages which run on common roads, and which have to turn within a short space, and consists in lifting one of the driving wheels off the ground when the carriage is turning round. A strong arm is mounted on each side of the carriage, turning at its upper end on a centre fixed to the frame. On the lower ends of these arms small wheels are mounted, and when it is desired to turn the carriage one or other of these arms is forced down by a screw so as to lift one of the driving wheels sufficiently to allow it to slip freely on the ground while going round the curve.

HOBBS, A. C. *A domestic bell telegraph.* Dated Feb. 24, 1858. (No. 358.)

This consists of an apparatus operated by an electric current for disclosing the number of a room or other signal to which attention is required; at the same time the notice of the attendant is attracted by the striking of a bell.

HECTOR, A. H. *Improvements in apparatus for taking or catching fish.* Dated Feb. 23, 1858. (No. 361.)

This consists in the use of galvanized wire ropes or lines and galvanised wire for general fishery purposes.

GIRARDET, C. *A new movable shaft bearer or supporter of coaches.* Dated Feb. 24, 1858. (No. 363.)

Two pieces of metal, leather, &c., are joined by a hinge, so as when closed to form a cylinder serving as the bearer for the shaft. This cylinder is attached to the proper strap, and the shaft has only to be placed into the lower portion of the open bearer or tug, which is immediately closed and locked together.

KAYE, C. *Improvements in couplings for connecting and disconnecting wagons and other carriages on railways.* Dated Feb. 24, 1858. (No. 364.)

For carriages, &c., with "dead buffers," the inventor hinges to the draw bar a metal loop or half-link of sufficient length to pass over the hook on the next carriage, &c., to be coupled. Under the draw bar, he fixes a wheel, and connects the metal loop or half-link by chain or rope to the wheel, carries the chain, &c., from the front of the wheel, connects it by a pin to the link, then carries it over a pulley fixed above the draw bar down again to the wheel. He carries the axis of the wheel outside the wagon on each side, and connects thereto at each side a weight. By raising or lowering the weights, either or both of them, without going inside the wagon or between the rails, the loop is brought down or raised, and the carriages, &c., thereby coupled or uncoupled. For carriages with spring buffers the pulleys and draw bars require to be connected to springs, and the draw bar to play in and out under the carriage.

NEWTON, A. V. *Certain improved means of relieving the slide valves of steam engines of unnecessary friction.* (A communication.) Dated Feb. 24, 1858. (No. 366.)

This relates to an arrangement of rollers, guide frame, and bearing plate for neutralising the pressure of steam on the under side of slide valves of steam engines, and enabling them to work steam-tight with but trifling friction.

NEWTON, A. V. *A mode of varying the length and reversing the direction of the throw of an eccentric, applicable to the reversing gear of locomotives and expansion gear of other steam engines, and to other purposes.* (A communication.) Dated Feb. 24, 1858. (No. 368.)

This relates to a mode of applying a double oblique slide to an eccentric to vary or reverse the throw thereof, by moving the said slide longitudinally to the axis of the shaft of the eccentric. It is particularly applicable to the eccentrics of locomotives, supplying the place of the link motion, for by a proper arrangement of the parts a constant "lead" of the valve under all the required changes of condition of the eccentric is provided for.

BROWNING, H. *An improved composition for covering iron and other ships' bottoms and other surfaces.* Dated Feb. 24, 1858. (No. 369.)

This consists of verdigris ground in turpentine thinned with damma varnish, white copal, or "proper varnish." The composition is used as an ordinary paint, or is laid on as a thick paste. It

may be stained or coloured by ordinary materials used for paints.

TATHAM, W. *Improvements in machinery or apparatus for lubricating the pistons, piston-rods, cylinders, and other parts of steam or other engines, and which is applicable to other purposes where lubricating matter is required.* Dated Feb. 25, 1858. (No. 373.)

1. The inventor forms certain parts of the pistons, piston-rods, or cylinders, hollow, tubular, grooved, or with openings to convey or regulate the quantity of lubricating matter required. 2. He applies reservoirs, pipes, or tubes, to certain parts of the said pistons, rods, or cylinders, for the same purpose. 3. He applies one or more valves, clacks, pistons, taps, or pumps, to the same. 4. He actuates the valves, clacks, pistons, taps, or pumps, either by the engine itself, or by other suitable means.

SLATER, W., and S. SMITH. *Improvements in machinery to be used in turning and cutting metals.* Dated Feb. 25, 1858. (No. 377.)

This consists, 1. Of a chuck to be used in ordinary lathes for turning; this chuck is made with a movable slide so arranged that when the article to be turned, or the mandril, is placed in the chuck, it is retained in a central position by tightening up a set screw. It may be made compound, that is, with two slides at right angles to each other. 2. In a revolving spindle to which motion is given in a line with its axis. The article to be cut is held in a stationary vice; the cutting instrument is fitted into the end of the spindle, and is brought by levers against the article that is to be cut. The machine is particularly useful in rounding up the ends of bolts, screws, &c.

PITMAN, J. T. *Improvements in hand-lever self-inking printing presses for printing cards, envelopes, bill-heads, and other articles.* (A communication.) Dated Feb. 25, 1858. (No. 379.)

This relates to presses which print envelopes, cards, &c. The inventor attaches his type on a lever fitted so that the face of the type comes up before the inking into a vertical position, to be cleansed, and so that the operator can see after inking that all parts have been covered. The impression is given by turning the lever to a right angle from the above position, the inking roller is kept to the type by a spring, and the lever arm on which it moves is so adjusted by a set screw that the type strikes the roller exactly in the position to ink the edge roll over the type, and then passes to an ink table, where the ink is distributed on the roller by spiral springs.

LAMBERT-ALEXANDRE, L. P. *Improvements in apparatus and signals for preventing accidents on railways.* Dated Feb. 25, 1858. (No. 381.)

The lever of a fixed apparatus is moved by the passage of the train, and retained by a trigger held in its place by a spring that can be drawn back by a wire which leads along the line to the next apparatus. As this latter is being moved by the passage of the train, its lever pulls the wire, and thus releases the lever of the first apparatus, which is returned to its original position by a spring. These levers are connected to signals.

MACKWORTH, H. *Improvements in the separation, raising, and lowering of coal and other minerals, and in coking, and in apparatus connected therewith.* Dated Feb. 25, 1858. (No. 385.)

In raising or lowering coal, &c., by an endless band, the inventor contracts the band by rollers or rails, to confine the minerals; or he forms a cover to the band of rods or chains and plates pressed against the mineral by springs. He uses two endless bands with elastic ribs or cages on one or both, and in removing the fragments detached in boring by currents of water, flexible tubes may be used for conveying the minerals and suspending the boring tool and rods, or for lining the inside of the bore hole to conduct the water. To save breakage in loading into a vessel, he employs a revolving shoot or an elevator on a sliding frame inside the hold. Below the bottom of a highly-inclined endless band he places a shoot in a less inclined position to support the column of mineral descending with the endless band. By jointing the frame of an endless band he facilitates its unshipping from a vessel. He employs broad-linked chains to support the band, and stud or cam rollers at intervals, to keep it even and square. He curves the top of the band to give it a greater capacity. He conveys platforms or bars supporting heavy substances on an endless band, and provides for placing them in, and removing them from, the band. In tipping the wagons he makes use of vulcanised india-rubber springs to act as brakes. He employs elastic wheels to communicate motion to the machinery. In separating coal, &c., from earthy impurities by currents of water, he withdraws the water at intervals, to allow the mineral to be delivered in a drier state. He also introduces steam by pipes into the shoots by which the coal leaves the purifying machine. In employing continuously ascending currents of water for the separation of small grains, he works the machine by the same current of water which effects the separation. He draws off the gases evolved in the coking of coal in numerous currents, so that the coking may be rendered more perfect. With this object, he builds portions of the side and bottom of the oven or kiln of bricks or stone set without cement; or he perforates the bricks. In round or other ovens, he makes a number of small chimneys in lieu of one large chimney, and covers them with plates of mica or glass, so as better to watch the operation. He places coke ashes, clinkers, or loose stones in the oven or kiln to facilitate the removal of the gas, and prevent waste of coal. He removes the gas from above as well as from below the surface of the coal; provides for the removal of the dust and coke which may collect in the small flues; places perforated partition walls across or along the oven or kiln, and draws one part of the charge at a time. He causes the gaseous products of one oven to pass through the coal or coke in another oven; employs water or steam in jets or otherwise, to regulate and keep down the temperature of the oven or kiln; and causes steam to pass into or through the coke. By these means he also removes a larger portion of the sulphur. He also partially quenches the red-hot coke, and reheats it for the same object. He employs pressure to force gas or steam through the coal or coke.

HOGA, S. *Improvements in applying power in locomotion, by which a given force may, in its effect of overcoming resistance, be increased and multiplied.* Dated Feb. 27, 1858. (No. 387.)

This consists in a combination of well-known means "by which a given accumulated force produces another increased power, and this again generates proportionally to its own degree a still greater increase." The inventor combines the velocity of a moving body with the action of compressed liquids.

RAYMOND, J. T., and A. LAMBERT. *Ornamenting textile fabrics.* Dated Feb. 27, 1858. (No. 389.)

This consists in printing upon the surfaces of fabrics used for upholstery any appropriate device in varnish, size, or cement, by engraved blocks, and coating the surfaces so cemented with powdered substances of varied colours, causing the same to adhere to the cemented portions, and thereby form the pattern upon the fabric.

CAVE, W. *Improvements in apparatus for propelling vessels, carriages, and machinery.* Dated Feb. 27, 1858. (No. 392.)

This consists of a wind-wheel to be used for the propulsion of vessels by a screw or paddles, but is otherwise applicable to carriages on land, &c. The peculiarity consists in having the vanes placed with their surface parallel to the line of the axis upon which the wheel turns.

GILBEE, W. A. *Improvements in the branch pipes of fire-engines or pumps.* (A communication.) Dated Feb. 27, 1858. (No. 395.)

This consists in the application of a stopcock moved by a lever and connecting rod to the branch pipe of fire-engines and pumps.

CLARK, W. *Improvements in preparing paper for, and in obtaining photographic proofs or impressions.* (A communication.) Dated Feb. 27, 1858. (No. 396.)

This process consists of taking a sheet of paper which has been kept in the dark for days, and immersing it in a solution of salt of uranium. To operate with this sheet, it is covered by a photographic negative proof, on glass or paper, then exposed to the action of the sun, and afterwards kept in the dark; the proof is withdrawn, and the sheet is treated with a solution containing about 6 per cent. of azotate of silver. To fix this image, it suffices to immerse it in pure water.

MILLS, T. *Improvements in apparatus for treating and dressing flour or reduced grain.* Dated Mar. 1, 1858. (No. 398.)

These improvements cannot be intelligibly described without engravings.

HADFIELD, J. *Improvements in the manufacture of manure and other products, when treating sewage matters, and in the manufacture of colours.* Dated Mar. 1, 1858. (No. 400.)

This consists in filtering sewage through chalk and refuse tanner's bark, &c., saturated with solution of sulphate of iron, so as to separate the ammonia and solid substances, and produce either ochre or a base for fixing colours.

BROOMAN, R. A. *An apparatus for separating substances of different specific gravities, and for washing sands and earth.* (A communication.) Dated Mar. 2, 1858. (No. 409.)

At the top of an inverted cone is supported a receiving and mixing pan tapering downwards, having an exit through a central aperture closed by a stopper. Inside this pan is an agitator with blades, the shaft of which is geared to some prime mover. A supply pipe conducts water into the pan. In the bottom of the conical vessel slides are fitted so as to divide it at that part into chambers. The effect of the washing and agitation will be to cause the metallic particles to be deposited round the tapering bottom of the pan outside the stopper, which, being raised, allows them to fall into the water in the conical vessel, and to become deposited in the chambers at the bottom.

JOHNSON, J. H. *Improvements in surcharging or regenerating steam, and in the application of the same to steam engines.* (A communication.) Dated Mar. 2, 1858. (No. 411.)

This consists in combining a cooler and regenerator with a steam engine, so that the supplies of steam, after having exerted their pressure on the pistons, shall pass to the cooler, thence to the regenerator, to be there confined until surcharged, then to pass again to the engine, and finally, after acting upon the pistons, to re-enter the cooler, and so on continuously.

DRIGGS, W. S. *Improvements in piano-fortes.* (A communication.) Dated Mar. 2, 1858. (No. 414.)

This relates to a previous patent of the inventor, dated 1st Nov., 1855. The objects of the present improvements are to leave the sound chamber more free from obstruction, and still further to improve the tone, cheapen the construction, and reduce the weight.

GAUTROT, P. J. *Instantaneous tents, invented purposely for the use of public vehicles called omnibuses, but which can be also applied to any others, open vehicles, carts or wagons, and travelling hawkers, at a very low cost; new system of shelter against the inclemency of the weather.* Dated Mar. 3, 1858. (No. 417.)

This invention cannot be described without engravings.

PROVISIONAL PROTECTIONS.

Dated August 5, 1858.

1778. J. Luis, of Welbeck-st. A new waterproof tube without seams or rivets, and in the apparatus connected therewith. A communication.

Dated August 7, 1858.

1800. J. Luis, of Welbeck-st. A new twisting bobbin. A communication.

Dated August 26, 1858.

1930. W. Evans, of Sheffield, engineer. Improvements in machinery or apparatus for manufacturing saw backs.

Dated August 30, 1858.

1962. B. Hanson, of Paddock, near Huddersfield, manufacturer. Improvements in means and apparatus for sizing and drying woollen yarns or warps.

Dated September 2, 1858.

1994. J. Bleakley, of Accrington, machinist. Improvements in apparatus for communicating between the guard and engine driver of railway trains.

Dated September 4, 1858.

2008. D. Andrew, of Greenock, engineer. Improvements in apparatus for obtaining motive power.

Dated September 9, 1858.

2040. W. Prisley, of Walworth. Advertising by day or night.

Dated September 10, 1858.

2052. J. Knowles, of Bolton-le-Moors, cotton spinner. Certain improvements in machinery for preparing cotton and other fibrous materials.

2056. F. A. E. Guironnet de Massas, of Gerrard-st., civil engineer. An improved machine for decorticating and cleaning grain and seeds.

2058. D. Cheetham, of Rochdale, mechanist. Improvements in machinery or apparatus for preparing for spinning and spinning cotton, wool, and other fibrous materials.

Dated September 11, 1858.

2060. P. Journet, of Paris, mechanician. An improved toy.

2066. J. L. Hinks, of Birmingham, manufacturer. A new or improved tap or cock for drawing off and filtering liquids.

2068. W. H. Manning, of Devizes, gentleman. Improvements in candlesticks for holders.

2070. W. Gossage, of Widnes, chemist. Improvements in the manufacture of soda and potash.

Dated September 13, 1858.

2072. G. Flageollet, manufacturer, of Vagney, France. Improvements in self-acting mules.

2074. C. W. Siemens, of John-st., Adelphi, civil engineer. Improvements in refrigerators, and in the treatment of the freezing or cooling material or materials used therewith.

2078. J. W. Towell, of Regent-st. An improved helmet.

Dated September 14, 1858.

2080. W. Riley, of Bradford, York, overlooker. Certain improvements in looms.

2082. J. Luis, of Welbeck-st. Coke and gas kilns. A communication.

2086. R. Lakin, of Ardwick, Lancaster, machinist, and J. Wain, of Manchester, mechanic. Improvements in spinning mules, and other machines of that class, used for spinning cotton and other fibrous substances.

2088. S. St. C. Massia, of Pall Mall. Improvements in stoves or fire-places. A communication from J. C. T. Mousseron.

Dated September 15, 1858.

2090. F. Fowke, of South Kensington, captain. Improvements in fire-engines.

2092. E. Dorsett, of Old Broad-st., tar distiller. A portable carriage tank and furnace, to be employed for the purpose of creosoting hop-poles or other timber.

Dated September 16, 1858.

2095. G. Redford, of Moseley, Worcester. Making cartridges of metal or gutta percha, with or without bullets, and for other purposes.

2096. R. Allison, of Gravesend, engineer. Improvements in apparatuses for boring and sinking.

2097. W. P. Struvé, of Swansea, civil engineer. Improvements in apparatus for indicating strains on engine ropes or chains.

Dated September 17, 1858.

2099. C. F. Vasserot, of Essex-st., Strand. Machinery or apparatus for dressing and finishing fabrics. A communication from P. Labérie.

2101. E. Welch, of St. John's-sq., Clerkenwell, and James Biggs, of Norton Folgate, tobacco manufacturers. An improved tobacco press.

2103. J. H. Gresham, of Kingston-upon-Hull, gentleman. Improvements in copying letters, invoices, and other writings.

Dated September 18, 1858.

2105. J. Luis, of Welbeck-st. Improvements in the application of gutta percha for clogs, galoches, shoes, and boots, and for the apparatus connected therewith. A communication.

2107. J. G. N. Alleyne, of Alfreton, Derby. Improvements in the manufacture of wrought-iron beams and girders.

2109. A. Turner, of Leicester, manufacturer. Improvements in looms for weaving.

2111. T. Vicars, sen., T. Vicars, jun., and T. Ashmore, engineers, and J. Smith, baker, all of Liverpool. Improvements for the consumption of smoke in movable furnaces or chauffers, for heating bakers' and other like ovens.

Dated September 20, 1858.

2113. H. Barrow, of Birmingham, saddler. An improvement or improvements in cartridge-boxes.

2115. E. Riepe, of Sheffield, engineer. An improvement in the casting of steel.

PATENT APPLIED FOR WITH COMPLETE SPECIFICATION.

2128. F. F. Emery, of Massachusetts. An improved sewing machine. A communication from S. C. Blodgett. Dated September 22, 1858.

NOTICES OF INTENTION TO PROCEED.

(From the "London Gazette," October 5th, 1858.)

1093. D. W. Hayden. "Boilers."
1125. H. Brierly. "Spinning mules."
1141. J. Ronald. "Dressing hemp," &c.
1155. R. L. Hattersley. "Looms."
1157. M. Stevens. "Pulping straw," &c.
1161. P. A. Galitzin and S. Souschkoff. "Preventing destruction of ships from collision."
1163. W. Webster. "Propelling vessels."
1165. W. Webster. "Rigging vessels."
1170. J. F. Belleville. "Indicating the work of pumps."
1171. J. Courage. "Furnaces."
1188. F. Bouquié. "Chains."
1206. A. Arnal. "Nose-bag."
1213. J. Martin. "Preventing smoky chimneys."
1215. M. A. F. Mennons. "Fumigating apparatus." A communication.
1217. M. Henry. "Agents for dyeing," &c. A communication.
1220. J. B. Thornber. "Perambulators."
1226. J. Austin and J. Armstrong. "Coke."
1232. R. W. Chandler and T. Oliver. "Agricultural apparatuses."
1252. R. Owen. "Railway wheel tyres."
1268. C. Hancock. "Telegraph cables."
1277. J. Ferrabee. "Cutting grass; sweeping," &c.
1283. J. B. A. Lombard and X. T. Esquiron. "Obtaining saccharine substances."
1290. W. Clark. "Peruvian guano." A communication.
1294. J. Rawlings. "Thrashing machines."
1298. D. Moseley. "India-rubber thread."
1310. C. Cammell. "Railway buffers."
1311. J. Roberts. "Stove."
1339. A. V. Newton. "Cutting veneers." A communication.
1352. Baron Wedel-Jarlsberg. "Controlcompass."
1414. S. Barlow. "Bleaching fabrics."
1575. A. Shanks. "Planing, slotting, and shaping metals."
1778. J. Luis. "Waterproof tube." A communication.
1819. M. Henry. "Saltpetre." A communication.
1872. W. E. Evans. "Harmoniums," &c.
1901. F. F. Delpy. "Stay buscs."
1903. M. Benson. "Generating steam." A communication.
2018. J. Shanks. "Chlorine."
2044. J. Tatlow and H. Hodgkinson. "Railway breaks."
2056. F. A. E. Guironnet de Massas. "Cleaning grain."
2070. W. Gossage. "Soda and potash."
2079. C. J. Redpath. "Pumps."
2101. E. Welch and J. Biggs. "Tobacco press."

The full Titles of the Patents in the above Lis can be ascertained by referring back to their numbers in the Lists of Provisional Protections previously published.

Opposition can be entered to the granting of a Patent to any of the parties in the above List who have given notice of their intention to proceed, within twenty-one days from the date of the Gazette in which the notice appears, by leaving at the Commissioners' office particulars in writing of the objection to the application.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

2166. R. Robey and G. L. Scott.	2198. J. Bernard.
2180. C. Radcliffe.	2209. R. Wilkinson.
2184. W. Kempe.	2227. W. Spence.
	2230. T. Dickens.

LIST OF SEALED PATENTS.

Sealed September 30th, 1858.

496. A. Porecky.	702. T. F. Robinson.
579. L. Cowell.	710. J. Fowler, jun.,
673. T. Silver.	713. H. Cartwright.
686. J. Mercer.	722. J. Smith.
687. F. & W. Edwards.	724. S. Fox and J. Chesterman.
701. C. G. Russell.	

735. D. Davy, W. Bentley, and J. Davy.
740. E. P. Sibille.
743. W. A. Gilbee.
745. W. Armitage and H. Lea.
750. J. Doherty.
751. C. F. Whitworth.
754. J. Cartwright.
755. G. Davies.
756. G. E. Taylor.
757. G. Rowland.
758. F. W. Mowbray and J. Broadley.
762. T. Greenwood and J. Batley.
765. W. R. Jackson.
767. H. Bayley and J. Greaves.
771. R. M. Ordish.
772. A. Lees and D. Schofield.
776. J. Oxley.
777. S. T. Parmelee.
784. J. Rae.
785. A. C. Thibault.
813. A. V. Newton.
815. F. Preston and W. McGregor.
821. J. Harris and T. Summerson.
825. P. Brotherhood.
847. W. Latham.
852. W. Bullough and J. Harrison.
864. R. Peacock.
870. J. Adkins and T. O. L. Buss.
888. H. A. de Saegher.
895. T. Greenshields.
909. W. A. Clark.
936. W. Keiller.
982. C. Schleicher.
993. D. Thom and G. A. Phillips.
1004. M. Davis.
1010. T. W. Thacker.
1126. J. Copcutt.
1179. J. Luis.
1198. S. Osler.
1236. J. Luis.
1328. G. Bartholomew.
1386. R. and T. Winans.
1387. R. and T. Winans.
1388. R. and T. Winans.
1389. R. and T. Winans.
1526. G. A. B. Chick.
1641. J. N. S. Petrziwalsky.
1692. T. Line.
1738. G. T. Bousfield.
1801. J. Luis.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions.

NOTICE TO CORRESPONDENTS.

Articles and Correspondence designed for insertion in the ensuing Numbers of the *Mechanics' Magazine* must reach the Office by the Tuesday of each week, at the latest. It is highly desirable that they should be forwarded earlier if possible.

CONTENTS OF THIS NUMBER.

LONDON: Printed and Published by Richard Archibald Brooman, of 166, Fleet-street in the City of London. Sold by A. and W. Galignani, Rue Vivienne, Paris; Hodges and Smith, Dublin; W. C. Campbell and Co., Hamburgh.

Mechanics' Magazine.

No. 1836.] SATURDAY, OCTOBER 16, 1858. [PRICE 3D.

Edited by R. A. Brooman and E. J. Reed, 166, Fleet-street, London, E.C.

LANCASTER'S PATENT APPARATUS FOR CHARGING CARTRIDGES FOR BREECH-LOADING ARMS.

Fig. 5

Fig. 6.

Fig. 4.

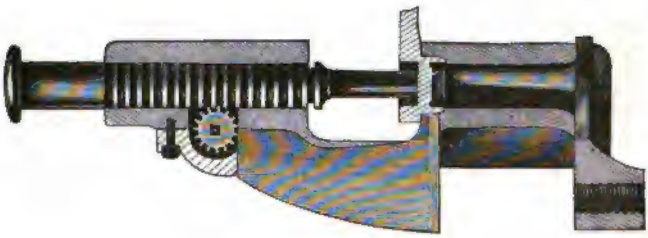


Fig. 3.

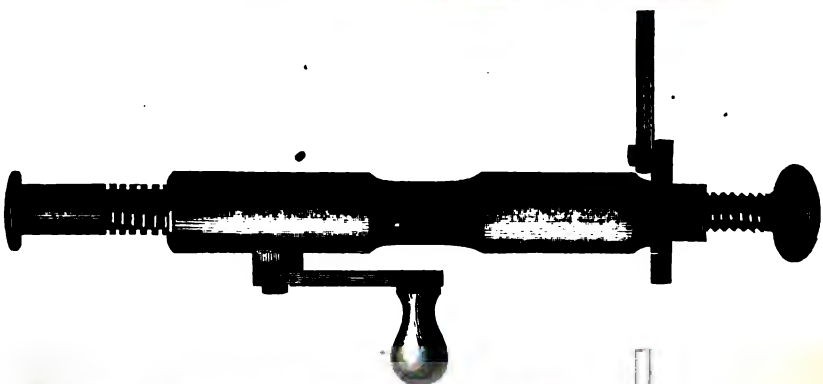


Fig. 2.

Fig. 1.

LANCASTER'S PATENT APPARATUS FOR CHARGING CARTRIDGES FOR BREECH-LOADING ARMS.

Mr. C. W. Lancaster, of New Bond-street, of rifled ordnance renown, has introduced a very useful apparatus for charging the cartridges used in breech-loading arms. The instrument consists of a cylinder with a sliding or hinged plate to form a bottom thereto, and of a plunger formed with a shoulder working up and down in a suitable guide. The operation is as follows:—The sliding or hinged bottom plate is drawn aside, and the cartridge case is introduced, open end upwards, through the lower part of the cylinder; the bottom plate is then brought under the cylinder and supports the cartridge case during the filling; the plunger is brought down until the shoulder reaches the top edge of the cartridge case, which it expands. After the plunger is drawn up powder is poured in through the top of the cylinder, and rammed down by the plunger, then a wad is placed over the powder, then the shot or ball and another wad, or not, as required.

When the loading of the cartridge has thus been completed, a grooved tool is placed in upon it, and, the plunger being firmly pressed down upon the tool, the latter is moved round about a quarter turn, and the grooved portion of it is thus caused to round and finish the end of the cartridge case.

The bottom plate is then moved back, and the cartridge is driven out of the cylinder by the plunger. The plunger may be driven by hand or by a treadle, and the instrument may be permanently fixed to a table or bench, or it may be provided with a thumb screw and stop, whereby it may be readily connected to and removed from a table, bench, or ledge.

In the engravings on the preceding page we have represented several views of an apparatus constructed according to the invention. Fig. 1 is an external side view, fig. 2 an external front view, fig. 3 a view similar to fig. 1, but partly in section; fig. 4 a plan view of the bottom, showing the bottom plate open, and figs. 5 and 6 are detached views of the grooved tool before mentioned. The up and down motions of the plunger are here produced by means of a handle which turns a pinion, which again takes into circular teeth formed around the solid cylinder above the plunger. By forming these teeth all round that cylinder the apparatus works equally well, however the solid cylinder may be turned about in the hollow cylinder or guide.

It should be understood that the plunger may be worked by other means than those described, and that other details of the apparatus may be variously modified without departing from the invention.

MR. HENLEY'S REPORT ON THE ATLANTIC TELEGRAPH.

The following is Mr. Henley's report on the Atlantic Cable, which we could not conveniently publish last week; it will be found to contain much information that is both interesting and useful:—

Gentlemen,—In accordance with your instructions, I have, since my arrival here on the 8th inst., carefully tested the cable at various times, and with different degrees of battery power, and I found its insulation seriously impaired, and the results of the testing lead to the conclusion that the injury is at a considerable distance from this (very nearly 300 miles of the cable apparently intervening between this point and the fault).

As I think it right you should know on what grounds and by what modes of operating I and others have arrived at this conclusion, and as you may also like to be informed as to some of the phenomena of electrical science as shown in connection with this cable, I have ventured to go a little into detail, hoping thereby to convey some information that may not be unacceptable.

On connecting one pole of a voltaic battery with the end of the cable with a galvanometer in circuit, and the other battery pole to the earth, I find the current meets a resistance to its passage equal to 290 miles of the copper conducting wire of the cable, and, as the cable is more than 2,000 miles long, it is therefore evident, that the greater part of the current finds a shorter route to the earth.

By resistance is meant the impeding force that electricity meets with in its passage through conductors of all kinds, metallic or otherwise, and which varies immensely, not only in various metallic and other bodies, but also in the same kind of metal, and this can be accurately measured, even in one inch of wire. Taking any given metal, the conductibility of which is uniform, the resistance of the wire will be found to increase as the size decreases, exactly in proportions to the sectional area. A mile of No. 40 copper wire is thus found to resist as much as 175 miles of the conducting wire of the Atlantic cable. It is necessary also that the fine wire should

have been previously tested with some of the cable, as wires of the same gauge are frequently found to vary very much in size as well as in conductibility. Knowing the resistance per yard of the fine wire, to obtain that of the cable comprised between the point of operating and the fault (and thus to find its length), the battery and galvanometer are connected with the line and earth in the before-mentioned manner. The degrees of deflection are accurately read on the galvanometer, and this process is repeated several times with batteries of different degrees of strength; the batteries and galvanometer are then disconnected from the cable and earth, and connected with coils of the fine wire, the length of which latter is added to or diminished until the readings of the galvanometer exactly coincide in every case with those noted when connected with the cable. The length of the fine wire will then give that of the cable up to the point at which the battery current finds earth, reckoning about one mile of the cable for every ten yards of fine wire. There are several methods of doing the same thing, but they are all based on the same system of proportionate resistances.*

There is next the resistance of the fault itself to be taken into account, for, strange as it may appear to some, faults (in proportion to their magnitude) may be equal in resistance to from one mile to several hundreds of miles of cable, and would give the same indications on a testing instrument. If we knew the exact nature of the injury, and how much of the copper was exposed, we could, with tolerable certainty, tell at what distance it existed; but in the absence of such knowledge we must judge from appearances, making use of any previous experience we may have had in matters of a similar kind. And firstly, we know, if much of the resistance was produced by the fault, it must expose a very small amount of surface, and that on sending positive currents, the wire (by electrolytic action) would be oxidised at the faulty spot, and the galvanometer would show the fault was partially repaired by the non-conducting power of the oxide.

On reversing the direction of the current, hydrogen would be evolved, which, by reducing the oxide and cleaning the wire, brings the fault back to its former state. Should it be of considerable size, and consequently of small resistance, the coat of oxide found would be very thin, and quickly reduced by reversing the current, showing that very little alteration was produced by changing its direction.

* Sir Charles Bright and his brother were, we believe, the first to discover and carry out the essential parts of these plans.—Eds. M. M.

Precisely this effect is produced by sending currents into the cable, indicating the injury to be of that character. A small fault could not reduce the strength of the signals to the extent we find them, unless the wire was separated near that point, and this (which is quite within the range of probability) would set our calculations at naught. That the cable is not severed we have abundant proof, but that any one can (by the most delicate tests) discover whether the conducting wire is so or not in a cable of this length I utterly deny. Should such be the case it does not follow that the line must be rendered useless, as I have known underground telegraphs work for months after the conducting wires have been separated more than a quarter of an inch by the decomposing power of the batteries employed. A slight fault existed in the gutta percha; this admitted moisture, which, by conveying the electricity to the earth, caused the decomposition of the wire, and then aided the working of the telegraph, by conducting a portion of the current from one point of the separated wire to the other. Signals were much reduced in power, as in the present case; still the wire continued to work, and if such can be done for months it might happen for a longer period.

If by any means the conducting wire separates and the gutta percha remains sound, all communication ceases, from the absence of moisture to complete the circuit. By our testing one fact is unquestionably established, and that is, the fault is not beyond 300 miles. I speak of the great fault; others may exist between that and Newfoundland, but if it be a fact, as I have heard, that on testing at the latter place very little earth is shown, the probability is that the other part of the cable is good. Having arrived at the fact of the injury not being beyond 300 miles, the difficulty is to know how much within that distance it is to be found, or how much of the resistance is due to the cable, and how much to the fault; and, although by accurate testing, and examinations a pretty correct knowledge of the facts may be obtained, still it is liable to some uncertainty, and instances have occurred in testing cables where the most experienced have been quite wrong in their conclusions.

I cannot think it possible for the injury to be in the harbour, but should think it advisable to lay down some length of shore end, as the present cable near the land must soon be injured by friction on the rocks and shingle. A piece of the same size laid across the harbour for the Magnetic Company was entirely worn asunder some days since.

In my opinion the fault or faults existed

in the cable before it was submerged, and would have been detected and made good had the precaution been observed of having the whole cable tested in water during its manufacture.

Its not showing so bad when first laid is easily accounted for, as it takes some time for the water to soak through the coating of pitch and tar. In a cable I am now manufacturing a fault was four days in the water before showing anything.

Had your cable been injured after submersion by resting on the sharp edge of a rock, the inner wire and the outer metallic covering must have come in contact,* and that this is not the case we have absolute proof, both from the fact of a battery current being generated by the iron sheathing and the exposed copper, and from signals being received from Newfoundland; for, did the iron touch the copper conductor in the smallest point, not the slightest signal could be observed. Signals were from the first much weaker than they ought to have been from a tolerably insulated line of that length, and were scarcely sufficient to work a very delicate relay (which can be used with a current so feeble that it could only just be detected on the tongue). The currents now received are not more than a tenth of that power, and can only be indicated on Professor Thomson's very ingenious reflecting galvanometer. This is constructed on the principle of the boy's "trick" of receiving the rays of the sun on a piece of looking-glass, and reflecting them on a wall, a very small motion of the hand giving a range of many feet to the spot of light. Professor Thomson attaches a small mirror to the magnetic needle of a very delicate galvanometer of his own contrivance; the light of a lamp is thrown on the mirror, and a motion of the needle that would be inappreciable in itself is plainly indicated by the reflected spot of light on a scale. The apparatus could be made much more delicate still, and capable of working with the smallest amount of current, but there is an obstacle in the way of using such a feeble power, and that is the earth current, which shows itself at all times more or less.

If this earth current were at all constant in its quantities or direction, it would be quite easy to compensate for it and render its effects neutral; but it is most erratic in its movements, sometimes throwing the spot of light entirely off the scale, at others changing from positive to negative and back again so rapidly and frequently, and with such regularity, that it is difficult to know whether it is Newfoundland or the earth current signalling.

These earth currents in submarine and subterranean lines (like the atmospheric currents, as they are termed, in overground wires) are produced by the inductive effect of natural currents of electricity moving parallel with the conducting wires, it being a well-known law of electricity that if a current moves in the vicinity of a wire or other insulated conductor, a current is set up in such wire in a contrary direction, its strength being in proportion to the parallelism of the wire with the natural current.

Any wire laid parallel with the equator, or nearly so, will have also its electrical condition disturbed by every variation in the earth's magnetism. On the first establishment of practical telegraphy the inconvenience experienced from these currents was as annoying as it was unexpected, but in course of time contrivances were produced capable of modifying or counteracting their effects, so that but little trouble is now felt from their occurrence; although even now occasionally on some lines all communication is stopped for a short time when these terro-magnetic currents are unusually strong. On lines of 100 miles or so they only show themselves at intervals. At other times the line is quite free; but on a line of such enormous length as the Atlantic cable, electric disturbance is sure to take place on some part of it at all times; and if a current is set in motion in any part the effect is communicated throughout the whole. In another cable (as well as in this, had its insulation been more perfect) earth currents would not cause so much trouble, as the working currents sent through the line would not lose their strength, as in the present case, and consequently would overpower them.

The mere resistance of the cable as regards its length would offer very little impediment to its working. The same length of insulated wire stretched on dry earth or other non-conductor, could be worked through with a very small power and at a rapid rate. It is only when it becomes surrounded by a conductor, such as damp earth or water, or by the metallic covering of the cable, that the phenomena of induction again come into play, and the more complete the insulation the greater will be the embarrassment from induction.

The effect of this is shown when a battery is connected with the line and earth, or outside the cable. The inner or conducting wire becomes charged or electrified *plus*; the outer coating, *minus* (similar to a Leyden jar). When the ends are put to earth the effect goes off, but not instantly, and when the two electrified media are so

* We cannot see the ground for the necessity which Mr. Henley's use of the word "must" here implies.—Eds. M. M.

far removed, as in a line of 2,000 miles, if connected with the earth a very considerable time is occupied both in charging and discharging, causing much retardation of the current, so that I think four words per minute will be the *maximum* rate of transmission through any Atlantic cable with the present dot and dash system. If other plans can be worked by which a letter would be indicated by one or two signals, the rate would be increased in proportion.

As I have made use of the terms "resistance" and "retardation," and as they are words having different meanings, I will explain what constitutes the difference. The "resistance" of a wire has the effect of keeping part of an electric current back, or diminishing its quantity, without affecting its velocity, the remainder passing as quickly as it would through a wire of the same length, with less than a hundredth part of the resistance. The effect of "retardation," on the contrary, is to diminish both the quantity and the velocity of the current. For example, in an overground, well-insulated wire, 2,000 miles long, an electric current or impulse would traverse the entire length in one-tenth of a second: through the same extent of submarine line, owing to the effect of the charge, the time occupied would be nearly a second and a-half.

Respecting the question of injury to the line from the use of powerful currents, if a small hole leading to the wire exists in a gutta-percha covering near either end, there is no doubt that a current of great quantity and intensity (whether produced by battery or coils) would have the effect of enlarging the breach by burning; but this can only take place to a limited extent. Heat can only be developed by an electric current when the latter meets with a great resistance; consequently, so soon as that is diminished by a slight enlargement of the hole, all burning ceases. I tried the experiment alternately with the large induction coils with the battery now here (400 cells of Daniell's), and with my large magneto-electric machine. They were each connected in turns with the line and the earth, and at the same time with a piece of gutta-percha-covered wire (in which the copper was bared to 1-32nd in. diameter) and a piece of copper in a basin of sea water, thus dividing the current between the two routes. The coil current enlarged the fault to 1-20th in. in diameter; the batteries to 1-16th, both very slowly. That from the magnet made no change in the fault it was applied to, until it was disconnected from the line and earth, and allowed the one road only; when burning took place, as might have been expected. The fault was enlarged very slowly to 1-10th of an inch. On repeating this with the coils, the fault was increased to 1-10th diameter, and with the batteries to 1-6th in., rapidly with both. No further burning can take place with either current until the wire is brought to the surface of the water, when, owing to the resistance increasing, by the fault being only partly immersed, the burning commences anew, and the gutta percha inflames.

On the arrival of my large magnetic machine I put it together, and connected it with the cable, and have used it a part of every day since, sending sometimes reversals, and at others words and sentences, I am unable to tell whether they were received and understood, but hope to find such has been the case on the receipt of intelligence from Newfoundland. Having a machine at one end only, it will, of course, be evident that even if they received properly they could not have answered better than before. But we have been encouraged by seeing more reversals and attempts to send words from them lately than before. I will leave the machine here; it will be worked at stated hours each day by the assistants, until the days fixed upon in October, when it will be used alternately as arranged with the battery and coils. The clerks at each end will then act according to preconcerted arrangements, which I hope will have the effect of renewing telegraphic correspondence. If that is not accomplished, probably the best thing then would be to raise the cable for about fifteen miles out, and test. I cannot say I have any hopes of the fault being found within that distance, but, as it would not be attended with any trouble or risk, I think it worth the trial. If the injury is in deep soundings, I believe any attempt to raise it would be the means of breaking the cable and losing the end altogether. If the state of the cable should not get worse, I am still in hopes of its being rendered workable by transmitting signals slowly, by having delicate receiving apparatus, and by adopting means for neutralising the earth current. Professor Thomson has partially succeeded in the latter object by throwing into the receiving end of the line feeble currents of different values (from one cell to 1-20th of a cell) in opposition to the earth current.

W. T. Henley.

CASTING RIFLE CANNON ON A CORE.

Gentlemen,—I would cast cannon on a core rifled with two or three elliptic grooves of a uniform turn throughout. The Lancaster mode of having an *increasing* turn from the breach to the muzzle, although it answers with *plastic* lead, does not answer with a rigid metal like iron.

Rosherville, 12th Oct. J. Norton.

THE KEYHAM EXPERIMENTS ON THE ATLANTIC CABLE.

OBSERVATIONS MADE AT KEYHAM ON THE VARYING VELOCITIES OF SUCCESSIVE SIGNALS IN THE ATLANTIC CABLE.

BY E. O. WILDMAN WHITEHOUSE, ESQ.*

THE trial of a new form of alphabet proposed by my friend, Professor Thomson, for use on the Atlantic line, introduced me to the most striking and most embarrassing instance which I have seen of variations in the velocity of the same form of current, under circumstances which would appear at first sight to present like conditions.

The proposed form of alphabet required that every letter should consist of three, and but three currents—these being of alternately opposite polarities. The successive signals were to differ from each other in length or duration, as 2, 3, and 4 interchangeably—those units representing half-seconds. The signals were to be recorded by relay printing every current on electro-chemical paper; and from an arbitrary signal the whole were to he divided into triplets to denote the letters. There was found to be from the first no little difficulty in reading those signals, even upon so short a length as 1,200 miles, though the manipulation might be perfectly accurate, and in true time with the beats of a metronome, yet there was no certainty that the despatch could be deciphered. This arose, not from any difficulty about the form of alphabet, but from the indefinite length of many of the signals; they did not come out accurately as the hand had sent them.

A longer length of cable was tried, and the result was such as to lead to the utmost confusion of signals. When the symbols 2, 3, 4—2, 3, 4—2, 3, 4, were sent, the signals would be received as 3, 2, 4—3, 2, 4—3, 2, 4. This transposition of numbers perplexed me sorely for some time, and it was accompanied by a different error in almost every combination.

I was enabled at length to trace it to the different velocities with which similar currents will travel under conditions differing only as regards the previous state of the wire; thus, a current thrown into an uncharged wire travels with its normal velocity, while a current in all respects similar, if thrown into a wire just previously charged with the opposite force, is notably retarded, and travels with an appreciably lessened speed.

Now the brief magneto-electric currents employed, when used to indicate the prolonged 4-signal, had of course double the time allowed in which to discharge itself that the shorter 2-signal had; any signal, therefore, next immediately following a 2 found a relatively full wire, while that following a 4 came into a relatively empty wire, and the instant of arrival of such signal was altered accordingly.

Another fact conspired to make this apparent anomaly even greater; it was, that the duration of the contact with the primary battery used to excite the induction coils, being variable, produced varying amounts of magnetisation in the iron of the coils, and, of course, generated secondary currents of varying force; thus, during the long contact maintained for the 4-signal, while the cable was getting more fully discharged, the iron of the induction coils was becoming more highly excited, and generated, of course, at the next reversal a stronger current ready for the more rapid traversing of the empty wire.

The converse of this took place with the shorter contacts, and thus the confusion was complete.

The same phenomenon manifested itself to a certain degree in the use of the form of alphabet at present adopted, though in this instance it was hardly of consequence, because the primary contacts are always of equal duration, and the relative lengths of dot and dash being as 1 to 3 is such as to prevent their ever being mistaken for each other.

It did manifest itself, however, and in a very curious way. Whenever the manipulation was approaching the limit of highest speed the cable would admit of, the first dot in an A would be blended with the dash, while the first of the three dots in a B would be absent altogether, and with similar imperfections in other letters. This was traceable entirely to the varying velocities of successive currents, conditions being in all other respects alike, save that of the immediately antecedent state of the cable.

This difficulty was removed at once upon adopting a system of antecedent compensation, by sending into the cable, after every long signal, be it dash or pause, a small amount of current immediately in anticipation of the succeeding signal, sufficient to assimilate the charged condition of the cable to that which obtains after the use of the other short signals.

This system of antecedent compensation, which admits of graduation to any required degree, has removed every trace of the embarrassment before alluded to, and it has been most gratifying to me to see the waves of electric force, after traversing the Atlantic from Newfoundland, represented so beautifully by reflection from the mirror of Professor Thompson's galvanometer, and

* British Association, 1858.

to be able to recognise, as it were, the very features of my friends, these antecedent wavelets, depicted by a ray of light, and to read off as I did by its aid those glorious words—

"Peace on earth, and good-will towards men,"

passing, as they did, through the wire from end to end, and repeated back to us from the distant station, without error or omission.

AN APPARATUS FOR LAYING DOWN SUBMARINE TELEGRAPH CABLES.

BY H. CONYBEARE, ESQ., C.E.*

My invention consists in the construction of machinery composed of a resilient and articulated series of segments or frames, which extend from the stern of a vessel employed in the submerging of submarine telegraph cables, and over which machine the cable is to be paid out, being delivered from a trumpet-mouth shaped congeries of friction rollers, situated at the outer extremity of the frame furthest from the stern, in which machinery the resiliency decreases gradually from that part of the apparatus next to the stern to the extreme outer end thereof in a manner similar to that in which the resiliency diminishes from the butt to the top joint of a jointed fishing rod.

The articulated joints or segments of the apparatus are formed of frames, each frame, starting from the stern, being smaller than that supporting it. Strong springs such as coach springs, fixed to one frame and linked to the farther extremity of the vessel, are employed to give resiliency to the articulations between each frame and that next to it, and the frame furthest from the stern terminates in a semi-conoidal or trumpet-mouth shaped debouchure, consisting of rings of friction rollers breaking joint with each other, and so arranged as to present a rolling surface of moderate curvature to the escaping cable, at whatever angle with the course of the ship it is compelled by side currents or lee-way to quit the apparatus.

Over this resilient and articulated series of frames is a rigid spur of wood or metal, having suspended from it outward as many pulleys as there are joints in the apparatus last described. An equal number of pulleys is provided inboard. A rope or chain is connected to the extremity furthest from the stave of each joint, then to a spring or not as deemed necessary, and then, passing over one of the outboard pulleys and one of the inboard, in the rigid beam, is attached to a spring apparatus, so arranged as to give a resiliency graduated according the position of such particular piece in the series.

This spring apparatus consists of a series of wheels and axles. The resilient springs act on the axles in each case, and the ropes or chain leading to the various parts of the laying apparatus are attached to the wheels. The ratio of the diameter of the wheel to the axle varies in each case, according to the amount of resiliency required by the particular joint or frame of the fishing-rod apparatus with which such wheel and axle are connected. Thus, as the delivery extremity of the apparatus is required to be moved through a comparatively large space by the exertion of a comparatively small strain, the ratio of the wheel to the axle in the resilient apparatus pertaining to this end frame is consequently greater than in that pertaining to any of the frames nearer the stern; and thus a graduated resiliency is obtained: or the same end is obtained by the employment of a spindle-wheel like that of the verge of a watch.

The required resiliency is obtained either by a vacuum or compressed air cylinder, by volute springs, or by springs of vulcanised india rubber.

The required graduated resiliency may be wholly obtained by the coach-like springs which give resiliency to the articulation of the frames; the chains or ropes led inboard from each joint over the rigid spar being merely employed to counterbalance the weight of each frame. Or the resiliency may be wholly given by the wheel and axle apparatus inboard.

* British Association, 1858.

A Large Russian Ship of War.—A large Russian ship of war, built for the Russian Government, was launched at the yard of Mr. Webb, of New York, on the 21st ult. The *Scientific American* gives the following particulars of this ship, which has been named the *General Admiral*:—

Her model is what is called the long flat floor, full bilge, sharp end, round stern, no poop or cut-water, and short forecastle deck. She is expected to attain a speed of fourteen knots under sail, and her draft of water will not exceed 25 feet. Her dimensions are:—Length on spar deck, 307 feet; breadth, 55 feet; length over all, about 325 feet; depth to spar deck, 34 feet. She is pierced with 44 side ports and two stern ports on the lower deck, and 30 side ports and 4 large ports forward, and 4 large ports on the spar deck. Her armament will consist of 40 shell guns of large caliber on the gun deck, and 20 long guns and 2 pivot guns of largest size on her spar deck. She is built of white oak, and will be propelled by two direct horizontal engines, now building at the Novelty Works, this city, each cylinder of which will be 84 inches in diameter, and 3 feet 9 inches stroke, with a nominal power of 2,000. The propeller is 19½ feet in diameter, and is one of Griffith's patent.

IRON MANUFACTURE.

A FEW FACTS CONNECTED WITH THE MANUFACTURE OF IRON IN THE NEIGHBOURHOOD OF LEEDS.

BY W. J. ARMITAGE.*

The object I have had in view in collecting the following facts is to bring before the notice of this section of the British Association a few points connected with the manufacture of pig metal and iron in the neighbourhood of this town.

As an introduction to the remarks I have to make, allow me to refer you to a paragraph in reference to this district contained in the Memoir of the geological survey of Great Britain, and of the Museum of Practical Geology for 1856:—

"The coal field of Yorkshire may be considered, especially in respect to its iron manufacture, as admitting of division into two parts—the northern and southern districts. In the former the lower part of the strata is developed to a degree of importance not seen in the south, by the occurrence of the beds of iron stone and coal which have given rise to the establishment of Lowmoor, Bierley, and Bowling, celebrated for the production of the best irons in Britain, and to that of Farnley, which is following in the same steps. The castings from these works are largely employed for special purposes where strength and tenacity are required, as for mortars and sea-service guns. Their wrought iron has the peculiarity of a granular structure, with a uniform, small, and brilliant grain, which closely resembles the character of Swedish bars. The superiority of the North Yorkshire iron proceeds from the care and attention bestowed upon the various processes, and from the admirable character of the seam of coal termed the Better Bed, differing from ordinary seams in its remarkable freedom from iron pyrites and other impurities. You may pass through the coking heaps or ovens without the least inconvenience from the sulphurous gases which in the coking of most coals are so freely liberated."

Having extracted these few remarks from the Memoir alluded to, I now proceed to point out the position occupied by this valuable seam of coal in the geological strata of the districts.

The superficial seams of coal worked in the immediate neighbourhood of Leeds are unconnected with the manufacture of the iron. I will, therefore, confine myself to a mere enumeration of these various measures in the order in which they are found:—

* British Association, 1858.

1. The stone or cannel coal.
2. The Middleton Bed.
3. The Beeston thin Bed.
4. The Beeston thick Bed.
5. The Crow coal.

Below the latter seam of coal we arrive at that portion of the strata especially connected with the manufacture of iron in the North Yorkshire district. A section of this part of the strata gives the following results:—

1. Loose vein of sand stone, 9 to 18 feet thick.
2. Black bed iron stone lying in a bed of shale, 3 to 4 feet thick.
3. Black bed coal, 2 feet thick.
4. Various measures of shale and stone. Roof of Better Bed coal consisting of black shale with numerous fish remains and small white nodules of iron stone, 120 feet.
5. Better Bed coal, 1 to 2 feet 6 inches.
6. Floor of indurated fire clay, 2 feet to 3.

From this portion of the strata, comprised within the short space of 40 yards, the materials employed in the manufacture of the iron are delivered. The Black bed iron stone furnishes the ore; the Better Bed coal the fuel. The Black bed is used for the engines, and from the valuable bed of fire clay are made the bricks and blast-furnace linings. The iron stone occurs in detached nodules of various sizes deposited in five distinct layers, which are designated as follows:—Top Balls, Flat stone, Upper rough measure, Middle Balls, Lower rough measure (small ragged bits). The superposition of these different measures is apt to vary. In some localities their course is difficult to trace in the surrounding shale. In others, where the seam is termed good, they appear to have been deposited with the most remarkable regularity, and to have remained undisturbed in the same state which had been assigned to them at the first formation of the strata. In the last case the ore is worked with greater economy, and yields a larger quantity of stone per acre; 1,000 tons per acre is about the average yield at Farnley. The fracture of this stone shows a blackish gray tint, and yields by analysis

Metallic iron	39·4	per cent.
Silica and alumina . .	14·9	„ „
Sulphur	·8	„ „
Oxygen, carbonic acid, &c.	44·9	„ „
	100	

Although it would appear from this analysis, compared with the analysis of other ores in the kingdom, that there are no peculiar properties connected with the iron stone of this district, either as regards

quantity or quality, to account for the excellence of the iron produced; it is, however, worthy of remark, that a singular affinity seems to exist between the ore and the Better Bed coal. The results of trials with other ores have been anything but satisfactory.

We now come to examine the fuel employed, and the first point that strikes us in burning a piece of Better Bed coal is its freedom from sulphur. It is a well-known fact that sulphur is one of the chief obstacles in the manufacture of iron in this country. A very small proportion of this element entering into the composition of the iron will cause the latter to be brittle, and thereby render it unfit for purposes where great strength and toughness are required. It is to the absence of sulphur that charcoal iron owes its pre-eminence. Hence the superiority of Russian and Swedish irons, and, in general, most irons manufactured with charcoal.

The Better Bed coal (in its freedom from sulphur) is, I believe, of all the coals in the United Kingdom the one which approaches the nearest to charcoal. I have had one sample of this coal analysed lately by Mr. Wood of this town, and the following are the results:—

Carbon	74·700
Hydrogen	5·000
Sulphur	·196
Ash	4·700
Oxygen	15·404
	100

Other analyses will have to be repeated on different samples of this coal, before the average amount of sulphur can be determined with precision. This first essay, however, is satisfactory, inasmuch as it places the Better Bed coal of this district in the foremost rank amongst the pure coals of England; and it is (as has been already stated in the Memoir alluded to in the commencement) to its exclusive use as a fuel that the good quality of the iron manufacture at Lowmoor, Bowling, and Farnley is mainly attributable.

It is not my intention to enter into the details connected with the manufacture of iron in this district, although I wish, however, to notice two points of importance in connection with the process of refining the pig metal at the Farnley iron works, and which are peculiar to that establishment. The first has reference to the introduction of steam into the refinery along with the blast. The results hitherto obtained by the adoption of this process are satisfactory, inasmuch as the quality of the iron has been improved, especially with regard to boiler plate.

The second point is the introduction of steel into the refineries in conjunction with the pig metal. Converted bars of steel in various proportions are melted in the refinery along with the pig. A perfect mixture is thus obtained, and the refined metal produced presents a more silvery fracture and a perfectly homogeneous texture. The metal thus obtained is worked with much greater facility in the puddling furnaces. A puddler operating on ordinary metal works up 9 heats (300lbs.) in his turn of twelve hours; whereas with refined metal, composed of two parts pig and one part steel, he can get through 12 heats in the same time. The stampings and lumps are then taken through the ordinary processes, and the finished iron obtained from this metal is to all appearances of a very superior quality. It welds and punches remarkably well, and its fracture presents a very fine, close grain.

It would be premature on my part to make any comparison between the quality of this "steel iron" and that of the ordinary iron of the district until proper and well-conducted trials have been made with respect to their strength and durability.

Messrs. Kitson and Co., of this town, have undertaken to test the boiler plate and bar iron, and two sets of locomotive tyres made of this iron are now running on the London and North-Western line, and Mr. M'Connell has kindly promised to give an account of the manner in which they have worn.

The Whitworth Cannon.—We regret to state that the results of careful experiments are once more adverse to the Whitworth gun. What Mr. Whitworth terms his 68-pounder broadside gun, of 95 cwt., and of the same calibre as an ordinary 24-pounder round-shot gun, was placed for trial on board the tender of the *Excellent* gunnery ship at Portsmouth, the mark for practice being the *Alfred* frigate, which has her sides protected by iron plates of the same thickness as those employed to cover the sides of the floating batteries. A few preliminary rounds were fired on Friday, the 8th inst., from the gun. Each round was loaded with extreme difficulty, nearly thirty minutes being consumed in washing the gun out with water, and forcing the projectile home. On the next day, Saturday the 9th, the gun was put under trial, and burst with great violence at the sixth round, making the vessel all but a complete wreck. Fortunately, owing to the authorities having taken proper precautions, being warned by the bursting of the other Whitworth gun at Shoeburyness, no loss of life or bodily injury was sustained by the officers and men conducting the experiments.

THE ROOF OF THE LEEDS TOWN-HALL.

BY THE ARCHITECT.*

The principal points which are worthy of notice in this roof are, the absence of a tie-beam, which allows of the ceiling of the hall being brought nearer to the exterior of the roof than is usually the case, thus economising space as well as cost.

The roof consists of eight sets of principals framed together; each principal consists of a semicircular laminated rib, formed of 12 1½-inch planks 9 inches wide, nailed together and fastened with wrought-iron bolts and straps (or clasps). They are placed in couples, and stand immediately over each of the columns in the hall; they are respectively 4 feet and 18 feet apart. The width of the room is 71 feet, and the springing of the ribs is 53 feet from the ground; the entire height to the top of the roof is 99 feet; the hall is 73 feet high in the clear.

This system of roofs has been adopted more frequently in France than in England. The only one that I am acquainted with in England, of any considerable size, is that at the King's Cross station, in London.

The laminated rib is the invention of a French engineer; it was at first suggested for a bridge in the year 1811 by M. Saint Phar, who proposed to construct a bridge across the Rhine with these ribs.

Several years later (from 1823 to 1830) M. Emy constructed several roofs on this plan, but all his roofs, as well as the one at King's Cross station, are very near to the ground at their springing, and are without ceilings, consequently much more manageable than this roof, which has a very elaborate plaster ceiling attached to it, and the springing is at a considerable distance from the ground.

I have, as you will perceive, taken the precaution to insert several additional struts and braces as a preventative against any change of form or outward thrust.

The success attending both these points has equalled my most sanguine expectations; in fact, there is not the least perceptible outward thrust or change of form since they were put up. The latter fact has been proved very satisfactorily by the plasterers, who were enabled to run the mouldings on the ceiling from a centre. The brackets for those mouldings were not gauged from a centre, but fastened to the ribs.

In constructing these semicircular ribs, I was much struck with the small amount of springing or alteration of form. By a mistake of the contractor, the first rib which was made was set free from the drum or core on which it was constructed, before any of the wrought-iron straps or bolts were fixed to it; the consequence was, the feet of the rib sprang out two inches, which I consider very little indeed under such circumstances. In the other ribs this mistake did not occur, and the alteration of their form or springing out was imperceptible.

I firmly believe, that if the principle of these laminated ribs was better understood by many of our church-building architects (who are exceedingly fond of constructing roofs without tie-beams) they would adopt it in many instances, instead of depending on three or four overstrained joints for the tie.

* British Association, 1858.

ON A MODIFICATION OF RUHMKORFF'S INDUCTION COIL.

BY W. LADD.*

Having been rather extensively engaged for the last two years in the manufacture of induction coils, and having received the constant and able advice of J. P. Gassiot, Esq., and the practical suggestions of Mr. C. A. Bentley, I have thought that a brief description of the machine as it is now made, with the results obtained, may not be uninteresting. My object has been not to make very large machines, but to obtain the greatest results from a three-mile coil, that being sufficiently large for all ordinary purposes. I find the best length for the iron core to be 13 inches and about 15·8 diameter, composed of fine iron wire not larger than No. 22, very carefully annealed. The primary wire should be of sufficient size to carry freely the whole of the battery current, and of sufficient quantity to thoroughly saturate the iron core with magnetism. For this purpose I use three layers of one continuous No. 12 copper wire, carefully annealed: if more layers are used I find that the secondary wire is removed too far from the magnetic influence. The secondary wire ought not to be larger than No. 35, covered with silk, which must be laid on perfectly even and insulated from the primary wire, and also from the layers of the secondary next to it. I find the best insulating medium to be the thinnest gutta percha made, and which I believe to be the only gutta percha sold which cannot be adulterated; it is true that it has many minute perforations, but by laying on at least six thicknesses between each layer of wire perfect insulation is secured. The greatest care must be taken in protecting the ends

* British Association, 1858.

of the layers so as to prevent the sparks passing from one to the other. The condenser should be at least 50 sheets of tin foil of about one square foot in size. These sheets must be separated from each other by three sheets of varnished paper or gutta-percha tissue. Every alternate sheet of foil is connected together, thus forming two poles, to be attached one to each side of the break. It may be placed at the bottom of the stand or in a separate box; the latter I prefer. In developing the power of the machine everything depends upon the contact breaker, which should be capable of retaining contact until the whole of the magnetism is obtained, and capable also of breaking contact as soon as the smallest quantity is induced. *These results are obtained in the break attached to this instrument.* The hammer is made to vibrate freely between the iron core and the coil; and, the brass screw terminating with the platina plate at the back of the hammer, a very small amount of magnetism will be sufficient to attract the hammer and so break the contact. If now, I bring this screw (placed half-way up the spring carrying the hammer) to bear upon the spring, it will have the effect of pressing the two platina plates together, so that it takes a greater amount of magnetism to separate them. By this means I can regulate the power of the instrument to the purposes for which it is required. The battery I employ is a five cells of "Grove's," with immersed platina plates 5 × 3, having an exposed surface of 140 square inches. With such a battery and a coil thus constructed, I can always insure sparks from half an inch to four inches in air. The machine now exhibited contains six miles of wire, and worked with the same battery gives 6¼ inch sparks. The position which the induction coil is now taking in this electrical age is one of considerable importance. It has awakened new philosophical ideas, and is being successfully applied to practical purposes of the highest advantage to mankind. For blasting purposes a three-mile coil is capable of firing fifty charges simultaneously. But, important as its present position is, and successful as its past application has been, it is yet in its infancy, and there can be little doubt that by *patient perseverance* machines can be constructed that will obviate the necessity for employing such ponderous machines, and still more ponderous batteries, as are now at work on the Atlantic cable.

THE INFLUENCE OF THE MOON UPON THE TEMPERATURE OF THE EARTH.

It is a prevalent opinion that the moon exercises an important influence upon the weather, and particularly on the formation or dispersion of clouds. The sailors have a common saying, "that the full moon ate up or devoured the clouds;" and Sir John Herschel has somewhere stated that the nights about full moon, particularly at certain seasons of the year, are remarkably cloudless. This indirect influence, then, being admitted, it became more important to trace it to an influence upon the temperature. For this purpose Mr. J. P. Harrison has entered upon a series of observations, the results of which he communicated to the British Association. The author first recapitulated some points which he considered had been almost established as meteorological facts: viz., 1. that the temperature before the first quarter is lower than that of the second day after it. 2. That this fall and rise prevail most in the winter months and in the month of May. 3. That a reciprocity of action takes place between corresponding days of the moon's age. Thus, whilst it was found, both at Dublin and Greenwich, that for twenty-one consecutive years the mean temperature rose at the first quarter in more instances than it fell, it fell at the last quarter in more instances than it rose; and in the only two years in which a fall occurred instead of a rise at the first quarter, there was a rise instead of a fall at the last quarter. Between new and full moon this reciprocity of action was still more apparent. Here, for the same series of years, there was a fall in thirteen years after new moon, and a rise in thirteen years after full moon; and in five out of the eight instances in which a rise occurred instead of a fall at new moon, a fall instead of a rise took place at full moon. Also a like principle appeared to hold good in individual months. For example, in twenty-one consecutive Januarys a fall occurred in seventeen at new moon, while a rise took place in sixteen at full moon. The action thus apparent at different periods of the lunation was shown clearly in curves of temperature of each day of the moon's age. Mr. Harrison considered that the dispersion of clouds under full moon may now be taken as a fact, on the testimony of Humboldt, Sir J. Herschel, Mr. Johnson (the Radcliffe observer at Oxford) and others; Mr. Johnson having also noticed that this cloud-dispelling power commences about the fourth or fifth day of the moon's age, and lasts till she approaches the sun, the same distance on the other side; that is to say, the influence takes place at that time as well as at

full moon, though not necessarily continuously. Mr. Nasmyth also, who was considered a valuable witness, from his long-continued observation of the moon for the purpose of mapping its surface, was quoted as having satisfied himself that clouds disappear when the moon is about four days old; and also that, when this is the case for any length of time at new moon, the sky is clouded to a corresponding extent at full moon: another instance of the principle of reciprocity. Several well-known observers were also mentioned as having noticed the remarkable clearness of the morning of the 13th of September, or the fifth day after new moon. And lastly, even M. Arago's explanation of the popular notion among gardeners round Paris, that the moon which, commencing in April, becomes full in May, destroys their tender plants, it was thought might be quoted as evidence of lunar influence on the atmosphere, though given by him as a simple statement of the effects of terrestrial radiation on early vegetation. Mr. Harrison, in conclusion, expressed his belief that the remarkable regularity of the recurrence of a fall before the first quarter is due to the clearing of the atmosphere at that period, and the rise after first quarter to a more cloudy state of the sky. That the same effect is not so evident on the curves at the period of full moon, he considered might be due to the greater reciprocity of action which takes place at the syzygies, or new and full moon.

PHOTOGRAPHIC PORTRAITS.

Mr. Oliver Sarony, of Scarborough, has introduced a useful improvement in the production of photographic portraits. It consists in employing two or more negative portraits to produce a positive portrait. The patentee usually proceeds by taking a negative portrait in which every portion of the figure excepting one is sacrificed, in order to obtain an accurate representation of that one portion; say, for example, the head and neck; and afterwards he takes another negative, in which the head and neck are sacrificed, in order that a correct representation may be obtained of the person below the neck, including the hands and arms, or of those parts together with the lower parts of the figure; and, in taking the second portrait, in order that the hands may appear of the natural size, he removes the camera further back (if the hands be in advance of the other parts of the person), until it is about the same distance from the hands as it previously was from the head. From the two negatives thus obtained he prints the positive picture, printing from the first negative the head and neck, stopping out the hands and other parts of the person by masks, as is well understood; and, from the second negative, the hands, arms, and (if a third negative has not been taken) the lower parts of the figure also.

SCIENTIFIC BALLOONING.

ON THE DESIRABLENESS OF RENEWING BALLOON ASCENTS IN ENGLAND FOR METEOROLOGICAL OBJECTS.

BY COL. SYKES.*

With reference to the desirableness of renewing the balloon ascents, I shall limit myself to a very few words. The Section is aware that in 1852 the Kew Committee of the British Association effected four ascents. The observers who fearlessly went up in the balloons were Mr. Welsh and Mr. Green. The results of the observations were published in the "Philosophical Transactions," and Mr. Petermann, in the "Mittheilungen," has given a coloured diagram, from which, by a *coup d'œil*, the accordances or discordances in the results of the four ascents at the different heights at which the same temperature is named, are seen. 55° and 32° were observed as sufficiently marked. The differences may be owing to the different angle of the sun on the different days of ascent. The temperature of 55° on the different days was met with at 6,800, 3,900, and 950 feet respectively. At the fourth ascent, on the 10th of November, the temperature at the surface of the earth was below 55°. Now these differences may be owing to the different angles of the sun on the respective days of observation, and it would not be prudent to consider the inductions as normal conditions. Again, the rapid diminution of temperature in the upper portion of the ascents leads to the deduction of an almost inconceivably low temperature at the surface of the earth's atmosphere. It was found, also, that the tension of vapour, which at the surface of the earth was very considerable, at nearly 23,000 feet was found to be scarcely appreciable. All physical investigations require so many repetitions to insure trustworthy results, that I cannot believe that the Mathematical Section will consider investigations into the conditions of the upper strata of the atmosphere exceptional. I trust, therefore, that I only anticipate the wishes of the Section when I express a hope that it may be a recommendation to the Council to cause another seriesof balloon ascents to be undertaken.

Admiral FitzRoy, Mr. Hennessy, and other members of the Section, warmly advocated the importance of these balloon

* British Association, 1858.

ascents; but Admiral FitzRoy pointed out some of the difficulties which stood in the way of obtaining a renewal of them.

THE THEORY OF SOUND.

THE REV. S. EARNSHAW, in a paper upon this subject read at the late meeting of the British Association, said the only impediment to the complete development of the mathematical theory of sound has hitherto been the difficulty of integrating the partial differential equation

$$\left(\frac{dy}{dx}\right)^2 \quad \frac{d^2y}{dt^2} = \mu \frac{d^2y}{dx^2}.$$

As an approximative mode of surmounting this difficulty, it has been usual to assume

$$\left(\frac{dy}{dx}\right)^2 = 1.$$

But the author suggested that the legitimacy of that step is by no means evident, and announced that he has succeeded in integrating the differential equation of sound without approximative assumptions; that he has, in fact, obtained its *exact* integral; and in the result has possessed himself of the key to the various properties of sound. Among several others, it was stated that the exact integral accounts for the great difficulty which experimenters have found in obtaining accordant velocities of sounds,—for the sweetness of musical sounds,—for the rapid decay of violent sounds as they progress,—and proves that the velocity with which a sound is transmitted through the atmosphere depends on the degree of violence with which it was produced, and not (as in light) on the length of the wave; so that sounds of every pitch will travel at the same rate, if their genesis do not differ much in violence; but a violent sound, as the report of fire-arms, will travel sensibly faster than a gentler sound, such as the human voice. This last property the author stated to have caused him much trouble, in consequence of its being directly opposed to the testimony of almost every experimenter. For many affirmed, as the direct result of their observations, and others assumed, that all sounds travel at the *same* rate. Fortunately, it transpired at the meeting that in Capt. Sir J. Franklin's expedition to the North, whilst making experiments on sound, during which it was necessary to fire a cannon at the word of command given by an officer, it was found that the persons, stationed at the distance of some miles to mark the arrival of the report of the gun, always heard the report of the gun before they heard the command to fire; thus proving that the sound of the gun's report had outstripped the sound of the officer's voice, and confirming in a remarkable manner the result of the author's mathematical investigations.

A GEOMETRICAL CONSTRUCTION.

ON A MODE OF CONSTRUCTING THE RECTANGULAR HYPERBOLA BY POINTS.

BY G. THURNELL.*

THIS communication was illustrated by two figures. In the first Mr. Thurnell showed a simple mathematical construction; by means of concentric circles and parallel lines, he fixed any number of points that might be desired of a rectangular hyperbola. In the second figure he showed the application of this to the forming the mode by which to work the shafts of columns with hyperbolical entasis, exemplifying his subject by giving the leading measurements of the columns of the Parthenon.

The President observed, that this was a very simple and ingenious method of constructing the hyperbola by points, and might therefore be useful to architects; but, although the Greeks were fully aware of the properties of this curve, and may therefore have constructed the shafts of their columns by it, yet he much doubted whether, after crumbling for ages, the columns of the Parthenon could now give us the infinitesimal distinction between hyperbolic and any other curve they may have used.

TONNAGE REGISTRATION.—The report of the Committee appointed by the British Association to inquire into this subject was brought before Section G, at Leeds, when the following resolution was passed:—"That the report of the Shipping Committee be sent to the Council, accompanied by such a statement as the members of the Shipping Committee who declined to act on that Committee may think fit to prepare. Such report and statement to be dealt with as the Council may think fit." Under these circumstances, the report will not be published at present. A resolution was also adopted appointing a Committee on Shipping; it was as follows :—"That it is the opinion of this Committee (Section G), that the attention of all proprietors of steam vessels be called to the great importance of adopting a general and uniform system of recording facts of performances of steam vessels at sea under all variety of circumstances; and that the following noblemen and gentlemen be requested to

* British Association, Section A, 1858.

act as Committee to carry this object into effect, and to report to this Association at its next meeting:—Vice-Admiral Moorsom, Marquis of Stafford, M.P.; Earl of Caithness, Lord Dufferin, Sir James Graham, M.P., Wm. Fairbairn, F.R.S.; J. Scott Russell, F.R.S.; J. Kitson, C.E.; J. E. McConnell, C.E.; C. Atherton, C.E.; Professor Rankine, LL.D.; J. R. Napier, C.E.; W. Smith, Henry Wright. What the British Association can expect from such a motley committee as this we are at a loss to understand. It is most likely that the whole affair will fall through, for several of the members named will, we feel confident, refuse to bestow their time and talents upon any object whatever in conjunction with some of the parties here named, who have not the least ground for occupying the positions which they are presumed to be qualified for. The British Association degrades itself by permitting such appointments, and should guard itself more effectually than it has in this case done, against the pretensions of mere charlatans.

Mr. Fowler's Steam Ploughing Apparatus.—Mr. Jno. Fowler, who obtained the Agricultural Society's prize for steam ploughing, has just completed a patent for the use of two steam engines mounted on separate carriages to haul ploughs and other agricultural implements in such a manner that the power of the two engines is applied at the same time to give motion to the implement. For this purpose, two engines, each furnished with a pair of grooved drums, one or both driven by the engine, are placed opposite to each other, one on each headland, and an endless rope passes from one engine to the other, and takes two or three turns round the drums of each engine. The implement is attached to the rope, and is hauled by means of it backwards and forwards over the land between the two engines according as they are working to wind the rope in one or other direction. The engines traverse along the headlands as the work progresses, and the length of the endless rope is adjusted according to the distance between the engines by winding or taking up a greater or less length of it by means of a drum or apparatus carried by the implement. In this manner the patentee is enabled to use engines of half the power of those which it necessary to employ when the implement is hauled in both directions by means of one engine, or when it is drawn by two engines on opposite headlands working alternately; and these engines of smaller power are most useful for other farm purposes.

TABLES OF SQUARES AND CUBES.

ON A MODE OF CONSTRUCTING TABLES OF SQUARES AND CUBES.

BY CHARLES M. WILLICH, ACTUARY UNIVERSITY LIFE OFFICE.*

(*Abstract.*)

The square and cube of any number being given, the following squares and cubes may be readily found by Mr. Willich's "Theorems." In proof, generally—

Let x be any number whatever.

Then $x+1$ is the next succeeding number.

Theorem for Squares.—$\overline{x+1}|^2 = x^2 + x + \overline{x+1}$.

Theorems for Cubes.—$\overline{x+1}|^3 = x^3 + 3x^2 + 3x + 1$.

MR. BRETT ON ELECTRIC TELEGRAPHS.

In a recent letter on the Atlantic Telegraph, Mr. Brett makes the following remarks:—

"I cannot refrain to do justice to one man, Mr. Samuel Statham, of the Gutta Percha Company, to whom, more than any other man in Europe, and to whose able talents and unceasing labours (regardless of all expense), is due the present perfection and utility of gutta percha as an insulating medium in telegraphy. Step by step has he exerted his whole energies at every suggestion I or others offered him, from the single layer over the copper wire to the numerous layers now so perfectly insulating it; and from the single wire liable to separation in long lengths to the cord of wires at first thought impracticable to cover; and, finally, at the present moment, to a perfection of insulation fifty per cent. superior in electric conductibility to the cable recently laid between Valentia and Newfoundland, from the application of a compound over the copper, giving a perfect adhesion of the copper to the inner surface of the gutta percha, a fault I pointed out to him when the first line was laid between Dover and Calais in 1850. In a recently prepared cable of four gutta-percha wires, two insulated on this last principle and two on that of the recent Atlantic line, the deflections on a delicate galvanometer were as eleven to twenty-two in favour of the present improvement, or fifty per cent. superior to that hitherto used. I name these facts that the public may see what we may expect from our second new Atlantic line, which I hope will be laid next year; and also, that it may be understood, that by no chance of accident have these points of perfection been arrived at, but by a continua-

* British Association, 1858.

tion of incessant labour, united with deep thought in perfecting the means, which have engaged several able and practical minds on this object for many years. This should give confidence to the public in preference to the numerous but mostly impracticable suggestions which daily occupy the public press, as if the only solution of oceanic telegraphy had yet to be discovered. . . . I have hopes that the Atlantic Telegraph Company will be encouraged to lay a cable of three electric conductors next year, being convinced that, with the present experience, a cable could be so constructed as not to be liable even to the fault under which we are at present suffering; but I must be excused from going into further detail, or patents may arise on all sides to stop its progress by claims such as those now preferred on the most futile grounds. One word on rope or hemp covered cables. The whole of those proposed of late years are wrong in principle; rope-covered cables and simple gutta-percha coverings have been tried by others between England and Ireland, and elsewhere, and have been either lost or proved useless for all objects of durability. If oceanic communication is worth anything, it is worth doing well and durably. The experiment is too costly to repeat often. Durability is economy; not that I would have it understood as being prejudiced by our having arrived at perfection or beyond improvement. In the next attempt I would prefer solid wires in place of the eighteen strands of even small twisted wires, as more durable and more economical, the elasticity of the present having been found to be in excess."

THE ATLANTIC TELEGRAPH.

To the Editors of the Mechanics' Magazine.

GENTLEMEN,—I regret that your correspondent Mr. B. Cheverton should write so long a letter on such mistaken and insufficient data. Of the inconsiderate pushing without preliminary experiments I say nothing, because Mr. Whitehouse urged this very point from the commencement; and, when adverse events gave an unexpected opportunity, alas! adverse influences prevented Mr. Whitehouse from adequately improving it; but, as to any secresy at Keyham and there being only twenty currents per minute, or less than one word per minute, this is quite an error.

If Mr. B. Cheverton will send his address I will enclose a mass of printed evidence to show how Mr. Whitehouse has sought to make known his results at every step. And when the Directors sought to prevent this by degrading fetters dictated by an antiquated and selfish policy, Mr. Whitehouse instantly sent in his resignation.

As to testing cables in air or water, this has been an oft-disputed point. Mr. B. Cheverton should give evidence instead of loose assertion. He evidently chuckles third-hand at a mare's nest which Mr. Varley was *instructed* to discover.

I am informed on good authority that all cables hitherto have tested better in water than air—in other words, made and tested in air, they have improved by actual submergence. And *so it ought to be!* Nor is the Atlantic an exception.

Of the long tirade against the Whitehouse coil currents I care not here to expose the weakness, and something worse besides, in which those ideas have originated, but this will be fully and publicly exposed. We merely point to the incongruous fact that the very parties who condemn are applauding Mr. Henley's present efforts with coils of much greater intensity.

I stay not to deal with the long threatening paragraph on the size of a conductor, where Mr. Varley's superior knowledge and experience would make mincemeat of Mr. Whitehouse, ending in an allusion to an invalid patent of Mr. E. Bright, and the announcement of a stream of scalding water from an Atlantic geyser having melted the gutta percha and made the iron and copper to touch. I refer Mr. B. Cheverton to Mr. Whitehouse's paper before the British Association at Leeds, "on the size of a conductor," and he will there find *profound knowledge* with deep humility.

Most cordially reciprocating Mr. Cheverton's last paragraph,

I am, Gentlemen, yours, &c.,

SAMUEL E. PHILLIPS,

Electrician's Assistant to the A. T. C.

P.S.—Mr. Whitehouse has carefully anticipated Mr. Pitter's lion in the way. He has subjected not only perfect samples but lengths of Atlantic core made expressly faulty in various ways, to test the principle of increased density in pressure *to the utmost degree.* And with the enormous pressure of five tons to the inch no harm whatever to the insulation took place!

CAPTAIN NORTON'S SPINSTER SHOT.

GENTLEMEN,—I beg to enclose an extract of a letter from Captain Lemprière, R.E., instructor of rifle practice at Chatham, dated 23rd September last:—

"The spinsters answered admirably as far as I tried them."

Specimens of these Swift Camillas are to be seen at the South Kensington Museum and United Service Institution.

I am, Gentlemen, yours, &c.,

J. NORTON.

Rosherville, October 8.

TELEGRAPH CONDUCTORS.

To the Editors of the Mechanics' Magazine.

Gentlemen,—What a clever man your "Telegraph Engineer" would seem to be, with such exuberant electrical sprouting and luxuriant growth, unfolding blossoms, hidden sweets, golden measures, &c., &c.;* but, after inflicting two columns on the public to prove your great indulgence, what really does it all amount to, but an eloquent and unmeaning reverie brought on by an attack of jealousy and sour grapes, that an innovator of only two years should so far eclipse this knight of the pen that he dare not sign his illustrious and well-known name?

Weak, indeed, must be this literary pretender in the literature of submarine telegraphs, to taunt the name of Whitehouse with his crude and common-place notions of the numerical aspects of the "great laws of electro-motive force and resistance."

Let him consult the British Association reports in the *Athenæum* of two years ago, and a correspondence which ensued, when a veteran electrician and one of the ablest mathematicians in the land attacked this very cable beforehand in the person of Mr. Whitehouse, in order to prove that, because 6 times 6 made 36, &c., &c., therefore, the Atlantic cable being almost 36 times too small, it would prove an utter mistake, &c.

I need not tell you how this stripling slew the giant, because, *as a convert*, that gentleman is now one of the Directors of the Atlantic Company.

I need not tell you of the highly practical character of that refutation; it was the successful position of deep study, hard work, and extraordinary perseverance, and your electro-literary scribe will never taste such grapes, even were he to concentrate his life's power in the pursuit.

Let him follow this "Will-o'-the-Wisp" (who in the wretched reverie is pronounced to have ignominiously disappeared) to the present meeting of the British Association, and hear him who has "ground himself up in electrical science in two short years," and listen to this "self-educated genius," who has "blundered on by hit-or-miss rule of thumb philosophy," read five papers on submarine telegraphy, and one in particular "on the size of a conductor," and, if he be not ashamed of himself for ever, it is quite certain his friends will be of him.

I am, Gentlemen, yours, &c.,
Samuel E. Phillips.
Electrician's Assistant to the A. T. C.

* See p. 327, No. 1834.

TELEGRAPH CABLES.

Gentlemen,—On the 4th August last I provisionally patented a plan for the manufacture of "an elastic cylindrical spring or spiral cable," either of gutta percha or in combination with wire, formed throughout of continuous close coils, or only so in portions of the same, at given intervals of miles, by winding it round a cylinder, after being manufactured into the form of a cable; the object of the expanding spring principle being to give the cable, when either distorted or compressed in the process of paying out, the power within itself of resisting and relieving longitudinal or other strain, and of accommodating itself to the rise and fall of the paying-out vessel and breaks hitherto found so injurious and objectionable in the submersion of a perfectly taut, inflexible, and rigid rope. By means of these elastic cylindrical springs, the cable, whenever its course was over ridges or inequalities of plateau, would be able to ease itself, carrying with it its own "slack." The springs would also confer on it additional strength and additional weight to sink it.

I submitted my plan some time ago to Messrs. Reid, the well-known telegraphic engineers, and it was laid before the Committee of the Mechanical Section of the British Association for me, in September, through the kindness of an eminent scientific engineer.

I am induced to request your kind attention and insertion to these facts from having read, somewhat to my surprise, in the last Number of your valuable Magazine the following statement, in a letter dated Oct 4th, New Bailey-street, Salford, Manchester, and signed John De la Haye:—"The following is a plan for a new Atlantic cable which I have been occupied during several months in maturing. The six copper wires having been drawn together, as above described, into a solid rope, I would wind it round a slender mandril, so that it would assume an elongated spiral form. This would prevent any sudden strain to which the cable might be subjected from injuring the conductor, the spiral form allowing of its being stretched without being strained."

Your obedient servant,
Charles Maybury Archer,
3, St. James's-gardens, Haverstock-hill.

[We have to add, in justice to Mr. Archer, that we received a letter from him on the 30th Sept., accompanied by a photograph of a piece of cable constructed as he has above described.—Eds. M. M.]

SHIPS' PUMPS.

To the Editors of the Mechanics' Magazine.

Gentlemen,—You very properly say, "This pump controversy is of immense importance." Its importance is not likely to be overrated, because on the pump very frequently depends, not only the safety of ship and cargo, but, what is of infinitely more importance, the lives of the crew and passengers. Holding, as I do, the firm and deliberately-formed opinion, that a ship might be lost with a Roberts's pump on board, when, had she been provided with a Downton's, she could have been saved, I might fairly be charged with inhumanity did I not step in and do something towards elucidating the matter. If Mr. Roberts had not been candid enough to tell us, in his long advertisement, that his pump was inferior to Downton's, a mere glance of an eye *accustomed to scan such matters* would at once, on seeing the two pumps, decide against such a complexity of ever-changing passages as Roberts's contains. But Mr. Roberts confesses his inferiority in the following words:—

"On the 6th ult., at the end of the second trial of fifteen minutes, with six men to each pump, it was found that the water had gained $\frac{1}{8}$ of an inch against me. The water was again made level with the mark, and at the end of ten minutes, with eight men to my pump and six to Downton's, it was found to have gained $\frac{3}{16}$ of an inch against me."

Here is a confession on the part of Mr. Roberts himself, that eight men with his pump cannot do so much as six men with a Downton's. Thirty-three per cent. more work for the same labour is no trifle. It might be the means of saving ship and crew. Suppose a leaky ship to have a crew of twenty-four hands with a Roberts's pump taking eight men to work it, you have three watches of eight men each, the men work five minutes and rest five minutes, alternately, for eight hours, and then a watch below of four hours. With Downton's you would have four watches of six men to a watch, and thus have always two watches below at the same time. Thus, with a Downton pump the men would have twelve hours' watch on deck, and twelve below, with Roberts's pump they would have sixteen hours' watch on deck, and eight below. In one case the men would sleep as much as they would work, and in the other case only half as much. It is easy to see how men might be able to keep a Downton's pump going, and be compelled to give in and die with a Roberts's pump.

Now it must be obvious to every one that, if these statements be correct, this pump controversy is of the gravest importance to the shipping interest; and that they are correct, I will endeavour to make clear. Let us take any good work on hydraulics, and we shall learn that, if a tank can be emptied in 100 minutes with a straight pipe, it will take 111 minutes with one having a curved elbow in it, and 155 minutes with a sharp one; it will hence be seen how very detrimental sharp turnings must be in a pump. For let it be borne in mind that this difference of 55 per cent. in time involves a difference of 240 per cent. in work; because, to make the water pass through a pipe with a double velocity, you must increase the head four times. The height of the head varies as the square of the velocity. Now look at a Roberts's pump, count the number of sharp right angles between the suction and the delivery pipes: not to stand nice about a few, I put them down at ten—if it be disputed, I will prove that ten is under the mark. Now, think of water having to make ten rectangular sharp turnings in a pump, when one makes an increase in the work of 240 per cent.!

But bad, and almost incredibly bad, as the case so far appears, we have not yet seen more than half of the evil. Not only must you be chary of angles in a pump, but you must not alter the volume of the water, nor change its form, as it passes through the pump, more than you can help. Experiment has shown that one enlargement of the bore increased the time of emptying the tank from 100 to 147 minutes, three enlargements to 192, and five enlargements to 240 minutes. Now, the increase of work will be as the squares of these numbers, viz., from 10,000 to 21,609, 36,864, and 57,600. Five enlargements in the pipes of a pump will increase the work or manual labour 576 per cent. Think of these things, and then trace the water through a Roberts's pump. If water could feel astonished at all, it would feel so in a passage through such a pump: such jostling and squeezing, now here, now there, up here, down there, right, left, and then back again; now a cylinder, then a cone, then a rectangular prism, then a nondescript, then a triangular prism, then a rectangular prism, then a cylinder, and then back again through the other half of its course. Never before was water so used and bruised, and yet people profess to wonder why all this cannot be done without absorbing power. What a pity it is that water will not allow you to play all these fantastic tricks with it, without requiring the expenditure of labour; because, if water would stand such nonsense, such a greasy thing as cream would be sure to oblige us, and then we could churn and make butter without the labour

now required in churning. By the bye, the best thing Mr. Roberts could do with his pump would be to send it to agricultural shows as a *churn*. It would make a capital churn, only I am afraid there would be some difficulty in getting the butter out of those indescribably intricate passages, and from under *those foot valves which can be seen through solid cast iron.*

Mr. Roberts has sadly mistaken the bent of his genius in turning pump inventor. If his knowledge in some other department will only compensate for his want of knowledge of hydraulics, he must be eminently learned in that other department. What that may be I know not, but may safely predicate that it is not arithmetic. I am afraid his arithmetic gets him into sad scrapes. In his advertisement he makes a mistake in bringing cubic feet into cubic inches. The figures given are 72,944, and should be 82,944. He divides the given number by what he calls the capacity of his pump, and finds that without loss it should fill the tank with 76 revolutions; the actual being 80, he finds a loss of about 5 per cent. Now, if we divide the right number, we shall find the number of revolutions to be 90; so that, the theoretical number being 90, and the actual number being 80, we have a gain of 20 per cent., or, in other words, this wonderful pump gives out one quarter more water than it takes in! Well, if water could be swelled by beating and bruising, it would be in such a pump, but one quarter is rather too much.

But Mr. Roberts is not satisfied with having invented, certainly, the very worst pump that ever was seen—his ambition carries him still further, he must make his auxiliary apparatus as clumsy and as unmanageable as possible. The use of a suction plate is to enable you to take away your pump without disturbing the many suction pipes belonging to it, and Mr. Roberts actually patents the method of casting his suction plate on his pump! Thus, whenever he removes his pump, he must break all the joints of his pipes, and carry away with him that which can be of no earthly use; and it must cost him some labour to create the incumbrance. Again, with the pump in one piece and the suction plate in another, you can have two small holes in different parts of the deck, whereas, with the plate cast on, you must have one large one—a thing sometimes of serious importance. To say more on this wretched contrivance would be like throwing water on a drowned rat. Minor details are of little moment in a pump where there is a radical defect of such magnitude as to require at least twice as much force to work it as a Downton's, and that such is the case I have not a shadow of a doubt; and I stake whatever credit I may have as an engineer on the statement, and authorise you to give my name to anyone curious enough to ask for it. Trying pumps by manual labour is all nonsense; they should be tried by a small water wheel and a head of water. You may look as black as you like, or smile as encouragingly as you choose, at a water wheel, it will not alter its speed for you.

I am, Gentlemen, yours, &c.,

J. S. H.

IMPROVED PROJECTILES.

GENTLEMEN,—If I have well discharged my duty, as your remark on my letter published in No. 1833 implies, permit me to discharge it better, if possible, by a few words more on "improved projectiles."

I was perfectly aware the publication of my projectile, described in page 306, would not affect the patent right of Captain Norton with the public, or I should not have published it; and I again repeat, the Government is honourably bound to remunerate that experienced officer for his improvement in projectiles. It is clearly evident Captain Norton must have considered his plan, published in No. 1831, an improvement on his previous inventions, or he would not have *patented it;* and it is also evident by your remarks on my last letter, had I published my plan in 1854, when I appeared before the Select Committee at Woolwich, or at any date before Captain Norton procured his protection, that, as the inventions are so identical, "*the case would of course be different;*" but, as before observed, it is not considered the best of my inventions on this principle; and, as I make it a rule when a principle is sufficiently solved to depend on mechanical demonstration, if I undertake it, I leave it not till, so far as my ability will allow, I can make no further improvement; *and this accounts for my great number of examples.* It is due to the scientific world that I should thus state the fact, that it may be known what obstacles are placed in the way of improvement by the impolitic organized system pursued by the Government to keep back inventions legitimately but not politically brought under its notice. From the Select Committee at Woolwich both Dr. Drake and myself received marked attention, and from the then Master-General and those Ministers to whom I had been long known; but we were not in the road subsequently taken by the American breech-loading gun inventor, whose success and its consequences are now so well understood. Your readers must see the results of appearing before the Com-

mittee, resting on the merits of what is placed before them, and regret with me the strange sanctioned system under which Government officials act is more to be blamed than those gentlemen whose instructions are received from authority which they are by no means in a position to dispute, and which calls so loudly for reform. We had at least thirty improved projectiles, anticipating, more or less, all I have seen or heard of, and I believe the American officer at the head of the Ordnance branch of his Government, Captain Dahlgren, mentioned by Captain Norton in page 305 of your last Number, would find it difficult to say in which way American improved projectiles and guns have not been anticipated by inventions which I have more than once taken to Woolwich. As the 1854 Committee could not approve of breech-loading cannon, since admitted as important in principle, they also seemed not to consider improved projectiles wanted, although, since that date, numerous experiments have been made at Woolwich on projectiles such as I could not have ventured to recommend.

I have no patented projectile, although I have other patents of still greater importance; but it is a serious thing, Gentlemen, to be for ever spending money to protect yourself against a Government not inclined to respect the right of patent; and I have spent by far too much money in this shape to follow the example of Captain Norton or Captain Blakely in taking out patents for projectiles or improved cannon till some radical change shall be made in the Admiralty and Ordnance branches of the State.

To be induced to seek patent protection by the advice of the Government, *as I have*, and then find a determination not to use my inventions because patented, and to be "*pirated*" with impunity, and to be told, as I have also, to "*seek redress in a court of law, if I think fit*," is not very encouraging to gentlemen devoting their time and money for the improvement of the public services of the country. But this must be altered, and quickly too, unless we make up our minds to allow Russia and France to take the lead in war improvements, as they are determined, so far as they possibly can.

Projectiles are understood things, and must continue in use till gunpowder and guns are superseded, or some more effective way be found to decide the fate of war. But I am not a believer in the Fulton and Warner tales, although I am perfectly aware both our naval and military means of fighting must be greatly improved to meet the rapidly approaching changes which circumstances are forcing so seriously on our notice. As this is now so well understood, it is to be hoped the Legislature will see that the barrier which has so long kept back improvements be effectively broken in every department of the Government. This the Whigs promised, *to obtain the power which they were not inclined to use*; but Lord Derby, I hope, will adopt a safer and more honourable course, aware, as he must be, of the danger of allowing other Governments to be better prepared than ourselves.

I am Gentlemen, yours, &c.,

JOHN POAD DRAKE.

London, Sept. 25.

P.S.—As the above letter has remained unpublished for two weeks, I beg the favour of suggesting to Captain J. Norton to do his best with me to induce General Peel to take up the subject of improved projectiles in a form calculated to determine the merits of the numerous plans to which the Government's attention has been so long called. It is one of great importance; and the Minister at War, in my humble opinion, will do well to give it his early and most *serious consideration*. I gave to Captain Norton the credit of inventing elongated projectiles, and considered it right that he should have been duly rewarded for the discovery: but it appears by his letter published in No. 1834, page 331, I had been wrongly informed, and, like myself, he is merely an improver of earlier date, as "*S. Robins suggested it more than a century ago.*" Although I have had the use of rifles from 1806, the elongated projectile was not brought under my notice till the date named; and the one described in No. 1833 is one out of a great number of my improvements, *but not the best*; and I have still every desire to see justice done to Captain Norton or any other individual who can make an effective improvement in elongated or spherical projectiles, aware as I am its necessity is urgent.

J. P. D.

October 9th, 1858.

INSTRUMENT FOR MEASURING THE INTENSITY OF THE ATMOSPHERIC COLOUR.

GENTLEMEN,—This may, I think, be effected with an instrument constructed as follows:—Let two tubes of perhaps ½-inch bore and about a foot long be connected, and, to make it perfect, admit of variation in distance to suit different sights. One of these should contain another capable of freely sliding up and down, and this motion might be regulated by a screw, or possibly by the hand.

The telescopic tube should have ends of plane glass, and should contain a light (sky) blue liquid, which should proceed from a small vessel above the tube, into which it could be forced upon compression,

and from which it should immediately flow upon pulling out the inner tube. The apparatus is now complete save as regards the graduation of the inner tube, which is simply effected, and, if considered desirable, the whole might be fixed upon a stand.

Now, upon looking through both tubes and pointing the apparatus to the sky, it could, of course, be at once seen whether the artificial corresponded in intensity with the natural colour, and, supposing this not to be the case, the inner tube must be moved until this is the case. The degree upon the inner tube should then be seen, when comparison with the sky at other times and in other places can of course be made.

I need not insist that the longer the mass of any homogeneous liquid the darker it will appear. The thing is well known, and confirmed by the simplest observation, and the contrary is equally true.

I am, Gentlemen, yours, &c.,

J. Alex. Davies.

September 28, 1858.

News of the Comet.—Continental astronomers are not behind our own in the interest which they take in the comet. A telegraphic despatch sent from Rome to the Imperial Observatory of Paris on the 3rd inst. announced the appearance in the tail of the Donati comet of a nebulous body, taking the form of what may be called a minor nucleus, so that we are about, as the Abbé Moigno says in *Cosmos*, to observe with our own eyes the phenomenon of the comet of Biéla,—that is, the comet separating itself into two stars moving harmoniously in the same orbit. The Abbé Moigno informs us, that he carefully observed the comet on the 4th, in the parabolic reflecting telescope of M. Foucault, and found it to consist of a series of envelopes in the form of acutely-pointed crescents, within which blazes the nucleus, infinitely small, but intensely bright, like the carbon point of an electric light generated by a powerful Bunsen's pile. M. de Luynes, of Paris, has discovered in the primary envelope, a little to the right and below the nucleus, a very distinct black spot, which it is difficult to account for. But the most astonishing circumstance is, the existence of a conical space, void of all light, throughout the tail, opening from a point at the nucleus, and spreading out on either side of the axis of the tail. During the transit of Arcturus across the tail, on the 5th, the star lost brightness considerably while immersed in the sides of the tail; its apparently excessive splendour while in the middle of it arose probably from contrast.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

Ripley, A. *Improvements in machinery for rolling and polishing leather.* Dated Mar. 2, 1858. (No. 410.)

Between two benches, on which is placed the leather to be rolled, the patentee fixes a bed which supports a horizontal cylinder, within which works a piston having a rod, attached to a small chamber containing two rows of rollers, which is itself firmly fixed to the usual weighted rolling box. The boxes are caused by steam in the cylinder to roll on the benches. He regulates the admission of steam, and the length of the stroke, by a rod passing from a rod attached to the piston rods, and having upon it two tappets or studs, set to any distance apart, which, by acting upon levers fixed upon the rod or the spindle of the slide valve, reverse its motion.

Hooper, W. *Improvements in the manufacture of buffer and other springs when vulcanised india rubber is used.* Dated Mar. 2, 1858. (No. 412.)

Here each spring is moulded with a projection with dovetail or inclined sides, in order to fix it thereby in a recess of a corresponding form.

Newton, A. V. *An improvement in the process of manufacturing soda and potash.* (A communication.) Dated Mar. 2, 1858. (No. 413.)

This consists in preparing soda, &c., from chloride of sodium, by hydro-fluo-silicic acid, which is prepared by exposing a mixture of fluor spar and silica to the action of steam at a high temperature.

Monckton, E. H. C. *Improvements in distilling and rectifying, and in the apparatus to be employed therein.* Dated Mar. 3, 1858. (No. 415.)

This consists in the use of purifying chambers between the boiler or vessel containing the material to be distilled and the condenser, in connection with charcoal, salts, chemicals, &c., together with a process for increasing the surface pressure, or exhausting the air beneath, or both; also a method of purifying spirits by distillation in vacuo, and a process for separating the volatile oil.

Sleeboom, W. H. *Improvements in the construction of the keel of ships or other vessels.* Dated Mar. 3, 1858. (No. 416.)

The object here is to give the keels of sailing vessels a greater hold of the water when the hull is heeled over. The patentee places a length of timber (wedge-like in section) on each side of the keel, running either from stem to stern, or from any given part of the keel to any other given part.

Kirkley, G. and J. *Improvements in perforating slates or similar materials.* Dated Mar. 3, 1858. (No. 418.)

The patentee employs a lever press (or a screw press) for punching holes in slate, &c.

Graveley, W. H. *An apparatus for purifying sea and other mineral waters, and rendering them fit to drink.* Dated Mar. 3, 1858. (No. 423.)

This invention was described and illustrated in p. 290, of No. 1833.

Biddell, G. A. *Improvements in machines for cutting vegetable and other substances.* Dated Mar. 3, 1858. (No. 425.)

This consists in fixing to a frame a cutting plate, or cutters. The hoppers are so formed that the substances in approaching the cutters always descend into a less confined space, and cannot stick in the hopper. The hopper passes the cutters, and, by partitions placed in them, the substances are forced against the cutters, and the pieces collected on the other side of the frame. The hopper is put in motion by toothed wheels or otherwise.

Moore, P. *An improvement or improvements in the manufacture of hinges.* Dated Mar. 4, 1858. (No. 434.)

This consists in the ornamentation of hinges (particularly cabinet hinges) by making them of metal upon which a device has been previously impressed, or by impressing upon hinges already formed the patterns required.

Thomson, W. *Improvements in apparatus for*

applying and measuring resistance to the motion of rotating wheels, shafts, or other rotating bodies. Dated Mar. 4, 1858. (No. 437.)

The patentee claims:—1. The applying of the regulated force to a frictional chain or band of any kind, for resisting the motion of a rotating body, at that end or part of the chain or band where its tension is greatest, so as to prevent the possibility of the resistance becoming greater than that regulated force. 2. The applying the regulated force in the same manner when one frictional chain or band resists the motion of two or more rotating bodies. 3. The using of the arrangements before claimed for applying and measuring resistance to the motion of machinery for laying submarine cables. 4. The renewing the rubbing surface of the chain or band in the before-mentioned arrangements by causing it to move longitudinally. 5. The application of these arrangements to the measurement of motive power as described under the head of the fourth part of the invention.

BOYCE, C. *A new or improved anchor.* Dated Mar. 5, 1858. (No. 438.)

The patentee describes and claims an anchor having a movable cap situated at the back of the arms of the anchor, and jointed to the end of the shank, and bearing against and supporting the arms. The said cap, when the anchor is cast out, slides on the arms, and throws out the toggle on the lower arm, the toggle on the upper being permitted to lie flat upon the upper arm of the anchor.

COLLINS, H. G. *An improved method of obtaining impressions on an enlarged or diminished scale from engraved plates or other printing surfaces.* Dated Mar. 5, 1858. (No. 439.)

The patentee claims the taking an impression from an engraved plate or other printing surface on to a sheet of vulcanised india rubber, and then either stretching such sheet or allowing it to contract, as the case may be, and transferring from such sheet on to a lithographic stone or other suitable printing surface, from which a great number of impressions may be printed.

VASSEROT, C. F. *Improvements in the manufacture of wrought-iron wheels for locomotives, tenders, wagons, &c.* (A communication.) Dated Mar. 5, 1858. (No. 441.)

This comprises, 1. A particular form in which the parts forming the wheel are prepared, the whole wheel being built out of portions which are counterparts of each other. 2. Means by which these symmetrical parts are combined and put together to form the complete wheel. 3. A method and means of completely and firmly uniting them, so as to form a compact whole.

HEARDER, J. N. *Improvements in submarine telegraph cables.* Dated Mar. 5, 1858. (No. 444.)

This invention was described at page 219, No. 1830, Vol. 69.

PARSONS, C. F. *Improvements in machinery for producing and revivifying animal charcoal.* Dated Mar. 5, 1858. (No. 445.)

This invention was described and illustrated at page 265 of No. 1832.

JOHNSON, J. H. *Improvements in railway signals.* (A communication.) Dated Mar. 5, 1858. (No. 446.)

This signal consists of a disc on a signal post at the side of the line, and having an aperture covered by a coloured glass, to indicate "danger," or uncovered when the line is clear. The coloured glass is carried at the lower end of a hanging lever, and is counterbalanced by a weight at the upper end. This lever is connected to a second lever, moved by pairs of electro-magnets, the wires of one pair being connected to the rail, and those of the other pair to a metal bar not in contact with the rail, but in a position to be acted on by an insulated blade spring carried by the passing train.

MOATE, C. R. *Improvements in the permanent way of railways.* Dated Mar. 6, 1858. (No. 447.)

This has reference to permanent ways in which longitudinal bridge or saddle metal rails are laid directly upon the ballast (as in the "Barlow" rail), and consists in filling up the under side of such rails, or in covering over such under side or surface, so as to facilitate the packing of the ballast when being laid or repaired; and in the application of short tie rods to the under side of the rails, and across the hollow, to prevent the rails from spreading or becoming flattened.

DAVIES, G. *A substitute for red lead, either as a cement for joints or a coating for preserving metals.* (A communication.) Dated Mar. 6, 1858. (No. 448.)

The patentee claims the use of Burgundy red, or other analogous earth, for the preparation of a mastic as a substitute for red lead, and as a coating for preserving metal from oxidation.

BARTLETT, R. S. *An improvement or improvements in papers, envelopes, or cases for holding needles.* Dated Mar. 6, 1858. (No. 450.)

This consists in forming papers, envelopes, or cases for holding needles, by making an incision at that part of the blank at which the heads will be situated when the paper is folded, the incision forming an opening through which the needles may be withdrawn from the case.

NIBBS, J. S., and J. HINCKS. *Improvements in oil and spirit lamps.* Dated Mar. 6, 1858. (No. 451.)

The patentees claim, 1. Making the sides of the cones or deflectors inclined to each other at a small angle, so as to direct the air very obliquely upon the flame. 2. Connecting the gallery or glass holder of moderator lamps with the said lamps, by supports inclined upwards from the lamp to the gallery. 3. Constructing metallic deflectors and galleries of a dome shape, flattened or compressed at top, the dome and gallery being made in one piece. 4. Isolating the head of lamps burning volatile oils or spirits from the reservoirs of the said lamps, by plaster of Paris mixed with small pieces of cork or saw dust, and also a ring of cork.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

GOWING, J., and H. BULL. *Improvements in apparatus for preventing smoke, applicable to tubular boilers.* Dated Mar. 3, 1858. (No. 420.)

This consists, 1st. In applying to tubular boilers apparatus by which air is made to pass into a vertical pipe at the hinder end of the tubes, and issue from a series of perforated horizontal pipes extending on each side from the central vertical pipe in lines between the several rows of tubes, and at right angles thereto. By this means the air issuing through the perforations in the horizontal pipes will be directed on to the flame (above the line of the flame bed or furnace bars) immediately before it enters the tubes. 2nd. In substituting for the vertical pipe and the perforated horizontal pipes in the back smoke box, a chamber at the top of this smoke box, and vertical perforated pipes extending downwards therefrom, and arranged between each row of tubes.

SCOBLE, W. *Arranging the retorts, furnaces, flues, communications, and connexions, for the more economical manufacture of gas, and by which arrangement the generative heat may be obtained from either coal, coke, tar, or other similar combustible substances.* Dated Mar. 3, 1858. (No. 421.)

This consists in a method of placing the furnaces above the retorts and drawing the heat downwards, and accumulating and retaining the same in the different retort chambers that may be required. Any combustible substance may be used to obtain the primitive heat.

PARKER, B. *The manufacture of materials for coating, cementing, bedding, and otherwise protecting bodies, and which are also applicable to the construction or formation of various articles.* Dated Mar. 3, 1858. (No. 419.)

An elastic composition is made of india rubber, tar, powdered chalk, sulphur, and with flax or cotton waste to give tenacity.

FOWLER, J., jun. *Improvements in apparatus employed in laying down electric telegraph cables.* Dated Mar. 3, 1858. (No. 424.)

To reduce the strain on the cable in deep seas the cable is caused to descend in contact with a succession of pulleys, so as to press thereon and give motion thereto. The axes of the pulleys have attached to them paddles which offer resistance to the rotation. The pulleys are carried by two cables which descend from the ship to a greater or less depth.

HART, C., P. GIBBONS, and H. GIBBONS. *Improvements in the construction and arrangement of combined thrashing and winnowing machines, and in the application of animal power thereto.* Dated Mar. 4, 1858. (No. 426.)

The object here is to combine the straw-shaking, riddling, and winnowing apparatus with a portable horse-power thrashing machine. The machine is enlarged, and mounted upon four wheels. The straw-shakers are mounted on a frame which carries the wood sides of the shaker, the upper part of it is covered with sheet iron perforated with quadrangular openings, one edge of which is inclined down to form an angle with the shaker. Motion is given to the shakers by a rigger on the mortice-wheel spindle. The riddle is of cross pieces of wood inclined from the surface, upon which are mounted at right angles the semi-circular upper pieces forming a ridge and furrow which keep the short straws and cavings from the body of the riddle, while the chaff and corn find their way into the furrows through the riddle to the dressing machine. Motion is given to the riddle by a crank on the mortice-wheel shaft, thence by a rock staff to reach the proper angle. To apply the power of horses to working the same a peculiar arrangement of horse gear is employed.

URE, J. M. *Improved apparatus for lifting the driving wheels of a locomotive off the rails, and which can be used when the locomotive is either running or stationary.* Dated Mar. 4, 1858. (No. 427.)

According to one plan the desired effect is produced by depressing the leading and trailing wheels, the driving wheels being raised, and this depression has the effect of raising the locomotive and with it the driving wheels, the axle boxes of these last being previous locked to cause them to be lifted by the framing of the locomotive. The power is derived from steam admitted into cylinders suitably placed upon the locomotive, the pistons of which are connected to the mechanism which directly acts on the wheels.

HIPKINS, G. F. *Improvements in constructing and attaching knobs and spindles, and in connecting knobs to doors, drawers, and other articles.* Dated Mar. 4, 1858. (No. 428.)

The inventor forms the spindle with a screw at each end, and with a square part at the middle. He screws one end of the spindle into the knob, and slides upon the projecting part a nut, which engages in the knob, so as to be incapable of turning, and thereby prevents the spindle unscrewing when the knob is turned.

KNOWELDEN, J. *Improvements in obtaining motive power.* Dated Mar. 4, 1858. (No. 429.)

The object here is to save fuel, and the inventor effects this by economising and utilising the heat of gases from a furnace, and by employing the gases as well as the steam as agents for the production of motive power.

WILKINSON, W. *Improvements in machinery and apparatus for spinning threads, for preparing threads, for weaving and knitting, for covering cores with fibrous and other materials, and for making ropes, parts of which are applicable as pulleys, reels, and bobbins.* Dated Mar. 4, 1858. (No. 430.)

Upon a revolving table the inventor mounts as many bobbin or reel carriers as there are threads or strands required. Each carrier takes one bobbin, carrying threads or strands, coloured or not, and each bobbin is free to revolve on the axis of its carrier. The threads or strands upon these bobbins form the covering threads or strands, but the core (where a core is required) is carried upon a drum, reel, or bobbin behind or below the revolving ring, and is introduced through the central aperture in the ring. The inventor winds the finished material upon drums, bobbins, or reels, and forms the pulleys, reels, bobbins, &c., of ironstone or china, and ornaments the ends by printing or painting. For polishing threads the inventor passes them over rollers or through pipes in contact with horse hair. Where required, he renders the threads waterproof by passing them through a waterproof solution.

DEWAR, J. *Improvements in the manufacture of boots and other coverings for the feet.* Dated Mar. 4, 1858. (No. 431.)

The "uppers" are cut out of a flat piece of leather, being cut double to insure accuracy of form. Each upper includes the whole of the leather except the sole, the quarters being allowed for in the solid piece forming what is usually the upper. Each piece of leather is cut through at the two ankle portions where the quarters are joined on, so as to form an inclined slit on each side. In this condition the leather is crimped to form the instep portion on a wooden crimping block. The slotted portions at the ankles are now filled up by pieces sewn to the edges of the slits.

STEWART, C. P., and D. G. HOPE. *Improvements in locomotive and other engines.* Dated Mar. 4, 1858. (No. 432.)

The principal object here is to remove the excessive pressure on the back of slide valves. The upper part of the ordinary valve is extended at each end, so that the steam can only enter at the sides, and flanges are formed on each side. The valve when working is covered by a casing which has two facings; one flange of the valve works against an interior facing on one side, and the other against an exterior facing on the other side of the casing; so that the steam, &c., is prevented from getting between the casing and the valve, as it is kept close upon the ports by vertical pressure, and against the sides of the casing by lateral pressure. The tendency which the steam has to lift the valve is counteracted by external pressure acting on the edges of the flanges on the sides of the valve, the area of which is so proportioned as to give a surplus pressure to keep the valve down. An excess of lateral pressure is likewise obtained to keep the valve against its side facings, by making the side area of the flange on one side exposed to pressure in excess of that on the other side. Modifications are included. Secondly, the valve is so arranged that, when it is in a central position, both ports will be partially opened to the exhaust.

BOULTON, S. *Obtaining by an improved method certain products from materials used in the manufacture or purification of gas.* Dated Mar. 4, 1858. (No. 433.)

This consists in obtaining from any material containing oxide of iron that has been used for purifying gas, ammonia, prussiate of potash, prussiate of soda, prussiate of iron, sulphur, and sulphuric acid. The material is washed with water to separate sawdust, and is then immersed in a solution of carbonate of soda, carbonate of potash, sulphate of soda, or sulphate of potash, with lime. Heat is then applied, and the ammonia evolved during this operation may be condensed. For separating sulphur present in the solution, an acid is to be added. The clear solution obtained is to be crystallised for the production of prussiate of potash or soda, or be mixed with a solution of iron for the production of Prussian blue.

COWPER, T. *Improvements in the construction of ships or vessels, and the method of discharging bilge water therefrom.* Dated Mar. 4, 1858. (No. 435.)

The inventor disposes a series of dash boards between the low transverse bulkheads, one on each side of the keel line. These boards are set at an angle with the bulkheads, and form wedge-like spaces into which the bilge water upon the rolling and pitching of the ship is driven; then, by providing perforations through the bulkheads, the bilge water will be driven through first one bulkhead, then another, until it reaches a well or cistern into which the lower end of the pump dips.

BARHAM, A. G. *Improvements in the manufacture of gypsum.* Dated Mar. 5, 1858. (No. 440.)

This consists in submitting gypsum in its raw state to the action of high-pressure steam, or steam surcharged with heat, for separating water of crystallisation readily.

COMMON, N. *An improved arrangement of water-supply valve.* Dated Mar. 5, 1858. (No. 442.)

To prevent waste of water in water closets, the inventor provides in the outlet pipe an equilibrium valve which commands a two-way outlet passage, and this valve he actuates by a rock bar on a fixed fulcrum, and connected at one end with the valve rod, and at the other, with a link jointed to a fixed bearing. Other parts are added, and the whole so arranged that water can only escape at the moment the valve is moved from one seat to another.

COLE, J. F. *An improvement in watches and other time-keepers, and an improved escapement wheel or pallet to be employed therein.* Dated Mar. 5, 1858. (No. 443.)

This invention was described at page of 328 No. 1834.

SANDERSON, C. *Improvements in the manufacture of malleable iron and steel.* Dated Mar. 6, 1858. (No. 462.)

This relates to the production of malleable iron directly from the puddling furnace or charcoal refinery without the intervention of the process of refining the crude iron. This is to be effected by the method patented by Mr. Sanderson, 24th Nov. 1855.

CASENTINI, M. *Improvements in preparing and indurating plaster, in preparing surfaces to receive plaster, and in preparing or perfecting plaster surfaces.* Dated Mar. 9, 1858. (No. 473.)

This consists in mixing muriate of potash with the plaster, and sometimes adding glue. To prevent effervescence from brickwork or other material he applies a solution containing arsenic, muriatic acid, sulphuric acid, milk, and water.

SKENE, R. *Improvements in obtaining motive power from water.* Dated Mar. 9, 1858. (No. 475.)

This consists of an endless chain of water buckets passed over an upper and a lower carrying wheel, the water being supplied to the descending side of the chain of buckets at any required level.

DEACON, H. *Improvements in purifying alkaline lees.* Dated Mar. 9, 1858. (No. 476.)

This relates to the purification of the alkaline lees obtained in the manufacture of alkalies, and consists in the use of any mineral substance containing iron for the purpose.

PROVISIONAL PROTECTIONS.

Dated July 12, 1858.

1561. M. A. F. Mennons, of Paris. An apparatus for stopping leaks in ships. A communication.

Dated September 21, 1858.

2117. T. Cook, of Addiscombe, professor of fortification. Improvements in the method of preparing and securing bankers' and other crossed cheques against fraudulent erasure or removal.

2119. L. De Pariente, of Paris, gentleman. Improvements in apparatus to be applied to gas-burners, with the object of increasing the lighting power of the gas flame. A communication.

2121. J. Bethell, of Parliament-st., Westminster, gentleman. Improvements in treating pyrites.

2123. J. Dewrance, of Barge-yard, City, engineer. An improvement in the construction of pianoforte frames.

Dated September 22, 1858.

2125. J. Johnson, of Manchester, machinist. Improvements in machinery or apparatus for washing, churning, colour-mixing, or similar purposes.

2127. J. Hope, of Rhode Island, U.S.A. An improved calico printing roller.

2129. T. Howe, of Millwall. Improvements in smiths' forges.

2131. J. Tyssen, of Rotterdam, mariner. An improved apparatus for indicating the speed of ships and other vessels.

2133. L. Castelain, of Newman-st., Oxford-st. Converting all vegetable fibre, by aid of chemicals, into form to resemble horsehair.

2135. A. B. Childs, of Gower-st., engineer. Improvements in winnowing machinery.

Dated September 23, 1858.

2137. A. F. Jaloureau, of Paris, manufacturer. Improvements in the manufacture of pipes.

2139. T. C. Hinde, of Dudley, Worcester, iron merchant. An improvement or improvements in the manufacture of iron and steel.

2141. J. Wilson, of Sunderland. Improvements in floating docks.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," October* 12*th*, 1858.)

1207. E. Bond. "Aerated liquid."
1210. W. and H. Hodgson. "Spinning."
1235. J. Mannhardt. "Peat," &c.
1242. R. Roberts and W. Shaw. "Looms."
1245. R. Owen. "Water-closets."
1246. W. Clayton and J. Goodfellow. "Pistons for pumps."
1251. J. Mitchell. "Paraffine."
1254. T. Wilson. "Mangles."
1269. E. Cooke & G. Dickinson. "Bedsteads," &c.
1273. W. Porter. "Ordnance and fire-arms."
1280. J. M. Dunlop. "Sizing."
1281. H. Wimball. "Destroying turnip fly," &c.
1282. E. Vigers. "Bricks."
1285. J. M. Dunlop. "Printing rollers."
1288. J. C. Quince. "Stoppers for bottles."
1321. G. Hall. "Cartridges."
1331. L. F. Lemière. "Cleansing fabrics."
1336. W. Clark. "Combing cotton." A communication.
1338. W. Clark. "Preparation of a vegetable product." A communication.
1379. R. S. Newall. "Cords, ropes, and cables."
1397. J. Crossley. "Polishing glass."
1406. G. Schaub. "Door-plates," &c.
1492. D. Le Souëf. "Shaft-bearer." A communication.
1599. T. Bartlett. "Stoves, fire-places, and furnaces."
1629. C. Lambert. "Horse collars."
1728. N. S. Dodge. "Treating waste india rubber." A communication.
1812. T. G. Messenger. "Garden engines."
1876. F. Shaw. "Spindles for spinning."
1883. R. Anderson. "Stuffing boxes."
2003. A. Guye. "Escapement of chronometers and watches."
2060. P. Journet. "Improved toy."
2077. J. Turner. "Hats."
2103. J. H. Gresham. "Copying letters."
2128. F. F. Emery. "Sewing machine." A communication.
2135. A. B. Childs. "Winnowing machinery."

The full Titles of the Patents in the above List can be ascertained by referring back to their numbers in the Lists of Provisional Protections previously published.

Opposition can be entered to the granting of a Patent to any of the parties in the above List who have given notice of their intention to proceed, within twenty-one days from the date of the Gazette in which the notice appears, by leaving at the Commissioners' office particulars in writing of the objection to the application.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

2224. P. A. Halkett.
2243. W. Rothera.
2245. J. H. Johnson.
2267. J., A., W., & H. Thornton.
2309. W. Cotton.
2354. F. Valentine, D. Foster, and G. Haworth.

LIST OF SEALED PATENTS.

Sealed October 5th, 1858.

763. W. Ager.
778. F. A. Lecornu.
782. W. Rowett.
783. A. Manbré.
787. S. Bickerton.
789. T. Kay.
791. P. Ratel.
795. T. T. Jopling.
797. P. & F. Schäfer.
812. J. Knight.
822. A. H. A. Durant.
826. G. G. Brown.
840. W. Carron.
866. J. B. Smith.
867. D. Moore.
907. R. Bodmer.
935. M. Sautter.
1026. W. E. Newton.
1035. W. E. Newton.
1122. J. Hesford.
1196. C. Clarke.
1590. J. Rheinauer.
1623. C. Reeves.
1634. T. Bailey.
1754. W. Taylor.
1856. M. A. F. Mennons.

Sealed October 12th, 1858.

732. C. H. Chadburn.
802. G. Pye, R. Smith, and B. Crossdale.
803. W. C. Holmes and W. Hollinshead.
806. J. Gorham.
808. J. Gray.
810. E. Green.
817. L. Cowell.
827. G. Walker.
829. A. P. Price.
834. J. Grassay.
836. F. C. Gilbert.
837. D. Chalmers and J. T. Swallow.
839. J. R. Chirm, jun.
846. T. Luck.
915. J. Braidwood.
1425. P. Griffiths.
1570. J. A. Fussell.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions.

NOTICE TO CORRESPONDENTS.

Articles and Correspondence designed for insertion in the ensuing Numbers of the *Mechanics' Magazine* must reach the Office by the Tuesday of each week, at the latest. It is highly desirable that they should be forwarded earlier if possible.

CONTENTS OF THIS NUMBER.

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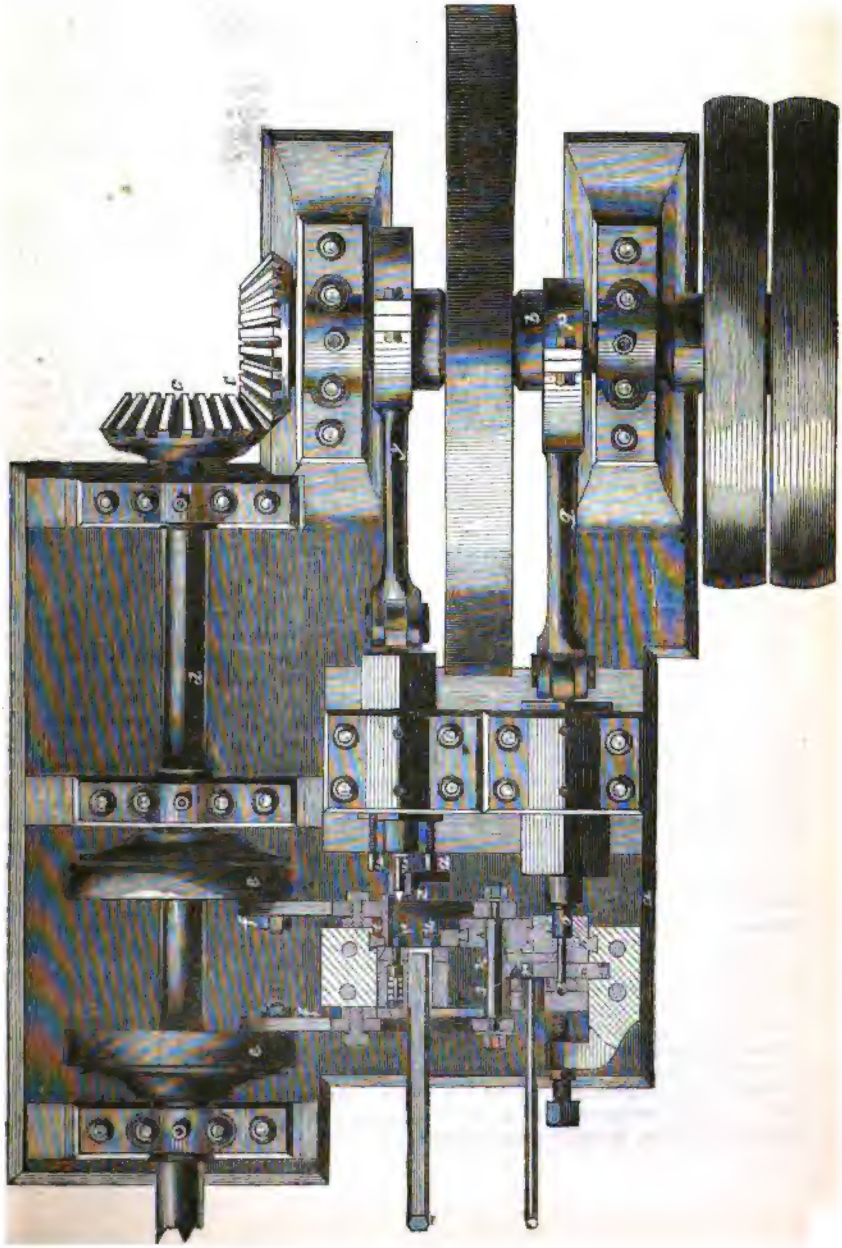
WARD'S PATENT MACHINERY FOR THE MANUFACTURE OF NAILS, SPIKES, BOLTS, NUTS, &c.



WARD'S PATENT MACHINERY FOR THE MANUFACTURE OF NAILS, SPIKES, BOLTS, NUTS, &c.

Mr. W. Ward, of Smethwick, has obtained a patent for a new set of machinery for the manufacture of nails, spikes, bolts, rivets, screw-blanks, and nuts, the machinery being so constructed that at each revolution of the driving shaft two or more of these articles are made.

Fig. 1 of the accompanying engravings represents a plan of a machine constructed according to his invention, partly in section. The main shaft, *b*, communicates motion through the bevil gear, *c*, to the shaft, *d*, and from these shafts the motions of the several parts of the machine are taken. The machine represented is constructed to manufacture both bolts and nuts, but it may be employed for the manufacture of bolts only or of nuts only, by the use of the proper dies or tools, as well as for the manufacture of nails, spikes, rivets, and screw-blanks. On the shaft, *d*, two hollow cams, *e*, *e*, are situated. By the rotation of the shaft, *d*, an alternating sliding motion is communicated to the connecting rods, *f*, *f*. Rollers on the ends of these rods engage in the hollow cams, *e*, *e*, and transmit motion from the cams to the rods. The bolts and nuts formed by the machine are made respectively from the cylindrical and hexagonal rods, *g*, *h*; other forms of rod may be employed. The rods are supplied to the machine, and portions are cut off and fashioned in dies, one die of each of the two pairs of dies being fixed, and the other moveable. The fixed dies are connected with the framing of the machine, and the moveable dies to the rod, *f*.

We will first describe those portions of the machine by which bolts are made from the rod, *g*. The fixed die of the of dies by which the bolt is made is marked *h*, and the moveable die of the pair is marked *i*. The fixed die, *h*, is connected with the framing of the machine by a dovetail, as seen in fig. 2, and the moveable die, *i*, is connected with the tool box, *k*, by a dovetail; the tool box, *k*, being carried by the connecting rods, *f*, *f*. The dies, *h′*, *i*, are represented closed, and in the relative positions they occupy after having formed a bolt, *l*. By the rotation of the shaft, *d*, the die, *i*, is withdrawn until it has passed the end of the rod, *g*, and on the further rotation of the shaft that die returns to the position represented. Before the return of the die, *i*, the rod, *g*, has been fed by the workman into the machine to the proper distance, and on its return it cuts off the end of the rod, *g*, against the fixed edge marked *m*. The cut-off portion of the rod, *g*, is held between the die, *i*, and the spring bolt, *n*, which follows the die, *i*, as it retires, until the end of the bolt, *n*, arrives at the cutting edge, *m*. The heated rods for large bolts on being fed to the machine are cut off by a double-acting cutter or shears, the cut-off end being supported against the fixed part of the cutter or shears. These latter may be adjusted to suit bolts of different lengths by set screws. The cut-off portion of the rod, *g*, is thus carried between the moveable die, *i*, and the end of the spring bolt, *n*, until it is brought into the position of the finished bolt, *l*. Whilst the cut-off rod is held between the dies, *h′* and *i*, a heading punch, *o*, advances, and, entering the dies, *h′* and *i*, compresses the end of the rod into a head. The heading punch, *o*, is actuated by the shaft, *b*, by means of an excentric, *p*, or cam and connecting rod, *q*. The die, *i*, and the heading punch, *o*, retire, and the spring bolt, *n*, forces the bolt, *l*, from the die, *h*. The bolt, *l*, falls from the machine; or, should it adhere to the die, *i*, it is pushed therefrom by means of the slide, *r*, actuated by the spring, *s*, which slide projects the bolt from the die, *i*.

The formation of nuts from the hexagonal rod, *h*, is thus effected:—The nuts are formed by the fixed die, *t*, and moveable die, *u*, the die, *t*, being fixed to the framing of the machine by a dovetail, and the moveable die, *u*, being fixed to the tool box, *k*, by a dovetail, as represented. The rod, *h*, being fed by the workman to the required distance into the machine, the die, *u*, advances and cuts off the rod against the cutting edge, *v*. The cut-off portion of the rod, *h*, rests in the die, *u*, and is carried therein to the die, *t*; and while it is held between the dies, *t* and *u*, the piercing punch, *w*, advances and pierces a hole in the nut. The piercing punch, *w*, is actuated by an excentric or cam on the shaft, *b*, and the connecting rod, *y*. The piercing punch, *w*, carries upon it a collar, *z*, which is capable of sliding upon the punch, the motion being limited by a pin on the punch engaging in a slot in the collar. The object of the collar, *z*, is to push the nut from the piercing punch on the retiring of the latter, and to form one face of the nut. The action of the collar is as follows:—The piercing punch, *w*, at first advances through the collar, *z*, but, the shoulder coming against that collar, both collar and punch advance together, and pierce and compress the nut. As the piercing punch, *w*, retires, it carries with it the nut and the collar, *z*, until the arms of the collar come into contact with the fixed stops, *a*,

by which its further motion is arrested. The punch, w, retiring into the collar, x, while the nut is prevented from moving, is withdrawn from the nut, which falls from the machine. As the piercing punch, w, first advances into the closed dies, t, u, its first action is to compress the metal so as to make it fill every part of the cavity of the closed dies, the opening in the plate or bolster at the back of the dies, t, u, being closed by a plug, the plug being kept to its bearing by a plate. As the punch, w, advances further, an incline coming under a lever lifts it, and brings a hole in the plate opposite the rod carrying the plug. The punch, w, now forces the superfluous metal from the middle of the nut into the hole in the plate or bolster, the plug retiring from the said hole, and the piercing of the nut is thus effected. As the punch, w, retires, the lever and plate resume the positions shown in the engraving, and the metal pierced from the nut is forced from the hole in the plate by a coiled spring, causing the plug to resume the position represented. Instead of a pointed piercing punch, a punch having a chisel edge may be used. The connecting rods, f, f, by which the moving dies, i and u, are actuated, are connected together and guided in the following manner:—A cross rod connects the ends of the rods, f, f, together, the said rod engaging in a slot. The rods, f, f, are further guided so as to preserve their rectilinear motion by the dovetails screwed to the said rods working in guides fixed to the headstock of the machine. Springs are placed under the journals of the shaft, b, to permit them to yield in case too much metal is fed to the dies. The moveable dies of the machine are sometimes actuated by other mechanism, as follows, when the bolts or articles made by the machine are of large size, and occasion considerable strain upon the dies:—The sliding frame carrying the moveable dies is made to perform an alternating sliding motion by means of a heart-shaped cam, engaging in a rectangular frame in the sliding frame. Motion is communicated to the cam by means of a connecting rod connecting it with a slide, to which an oscillating motion is given by another cam. The patentee sometimes makes two, three, or more bolts, &c., simultaneously, by having each fixed and each moveable die properly formed. When the metal is used in a heated state, the dies are kept cool by a stream of water.

HYDRAULIC ORGAN-BELLOWS.

ON THE APPLICATION OF HYDRAULIC POWER TO BLOWING THE BELLOWS OF THE TOWN-HALL ORGAN, LEEDS.

BY DAVID JOY, ESQ., ENGINEER.*

Hitherto, organs have been only blown by manual power, and this necessity has been a great bar to their general introduction. For chamber organs the inconvenience of a man to blow is scarcely less than the annoyance of the performer blowing for himself, which can only be done in the case of very small instruments. For churches and public buildings, where very large instruments are employed, the difficulty is greatly increased: added to this, the prevailing tendency of the builders both in England and on the Continent is to increase the wind pressure, and so from a 2½-inch column of water it has risen to 5 inches, and in some parts of large organs to 12 inches. This again increases the difficulty by requiring a greatly-increased power to provide wind at the increased pressure. Thus the grandest musical instrument, combining in itself the effects for the most part of a whole orchestra, is dependent on a troublesome need, which every performer has long complained of, but until now none have overcome. The difficulty has been attempted to be overcome, and some few years ago an organ was blown in London by clockwork moved by a ponderous weight. Of course, in any large organ this method must obviously fail. Water has also been used, and there are one or two cases on record of its application, details of which, for want of time, the writer has not been able to furnish; but the application was limited to the single cases. The last and most feasible is an engine designed and made by a Glasgow gentleman, and now the property of Messrs. Gray and Davison, of London; but this, from its great expense, has not been adopted.

The writer's attention was first directed to the subject three years ago by a request of his brother, Mr. Walker Joy, who has a large chamber organ of 40 stops, to design any motive power to render the organ independent, and as available as a piano. A moment's consideration at once pointed to water pressure as the only available source of power, especially as every town of any importance is now provided with its waterworks, maintaining a constant supply at a pressure. The proposition was now analysed thus:—First, what is required? second, how are we to meet that requirement? To work the feeders of an organ, a

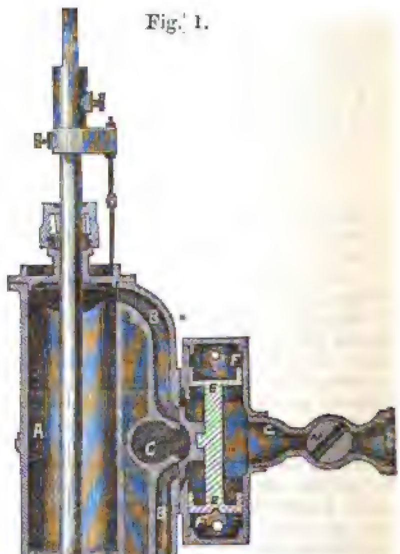
* British Association, 1858.

reciprocating motion alone is required; but it must be capable of perfect regulation down to an infinitesimally slow speed, and without impairing its certainty of action at that slow speed. Hence it cannot depend upon momentum to pass the dead points at the top and bottom of the stroke, as in a steam engine; and for simplicity it must only consist of one cylinder. It must also be absolutely independent of attention or lubrication, and be always ready for use. The first experiment was made with a single cylinder, similar to a steam-engine cylinder, with a four-way cock or valve to admit the water to the top and bottom of the cylinder. It is clear that, if this valve was moved directly from the piston rod as in the old Watt's steam engine, when moving slowly the piston would carry the valve until it covered all the ports, and, the power being then shut off, motion would cease. To avoid this, the four-way cock or valve was arranged not to move until the completion of the stroke of the piston, when it was pulled over by a spring. The movement of the valve was thus made dependent upon the piston arriving at a certain point in its stroke, and not upon its continued movement after that point. The engine would now work at any speed without sticking at the end of the stroke; but, from the rapidity with which the spring pulled the cock or valve round at each end of the stroke when moving quickly, a severe shock from the change of direction of the moving column of water was produced. This shock was removed by causing the lever moving the four-way cock to compress by its action a reservoir of air, which was allowed to escape slowly, hence retarding its action, and gradually turning the cock and changing the direction of the moving column of water. Theoretically, the difficulties were now overcome, and the engine for a time worked satisfactorily; but practically, it was found most difficult to keep the adjustments so correct as to maintain certain and steady action. At this point the engine was seen by an organ-builder of this town, who suggested moving the valve by what organ-builders technically call a "pneumatic lever," the valve of which lever was to be worked by the piston rod of the engine. The old arrangement of springs, &c., was stripped, and the pneumatic lever applied. It consists of a small pair of bellows like a "concertina," with a loose middle leaf, the two outer ones being fixed. By a small valve, wind is admitted from the wind-reservoir of the organ alternately at each side of this loose leaf, which, by its attachment to the four-way cock of the engine, gives it the desired motion. This produced a very steady and equal motion for the valve, and several engines were made and worked for some time on this principle under the name of "hydro-pneumatic engines."

It was about this time that the Leeds Town Council invited competition for plans for the large organ for the Town Hall, and this method of blowing was proposed, and plans of it forwarded. The engine, however, was found to give no permanent certainty of action, as the varying friction of the four-way cock, and its need of delicate adjustment, was a source of frequent trouble. It was also found impossible to keep it properly lubricated, and hence the lateral pressure upon it soon destroyed its figure.

To meet these difficulties the writer altered the form of the engine entirely, and, keeping only the cylinder, A, as shown in the annexed engravings, figs. 1 and 2, at-

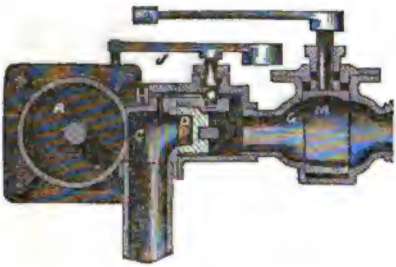
Fig. 1.



tached ports, B, exhaust, C, and valve similar to those of a locomotive engine, the valve sliding over a three-port face, as shown at D, fig. 2. This valve is moved by its spindle or guide being enlarged at each end with a small piston, E, E, working in a corresponding cylinder, F, F. These cylinders receive water pressure alternately direct from the same source as the engine itself, through a small four-way cock, I, which by the lever, J, is worked from the piston rod. The engine again in form for

action gave a still more perfect result, and by the introduction of a screw, into the outlet port of the small four-way cock, I, that port could be diminished at pleasure, and thus the two pistons E, E, carrying with them the valve, D, retarded in their motion, and the engine thus fitted to work under any pressure of water.

Fig. 2.



For some time the engine continued to work perfectly; but, shortly, difficulty was experienced in lubricating the valve upon its face, requiring attention varying from once per month to once in three to six months. Various metals were tried relatively for the valve and face, but all after a time squeezed out the lubricating material from between them, and cut into each other. Glass was tried with no better success. Lastly a lignum-vitæ valve was put in: this stood every test, and, though taking a little more power to drive when originally put in, it was found to need no lubrication of any kind, the water acting in place of it, and after being in use for some time showed less wear than any of the metal valves, and retained a greasy slime apparently permeating its substance.

The peculiarities of the engine as it now stands are:—1st. A machine giving out a reciprocating motion by the pressure of a non-elastic fluid, and capable of being regulated to the lowest possible speed without the possibility of failing at the return stroke, that return stroke depending upon a movement (that of the small four-way cock) completed by the previous stroke. 2nd. The adaptability of this machine to work under any pressure of the afore-named non-elastic fluid, entirely free from the shocks usually attending such machines from the necessity of suddenly changing the direction of the moving column, which may be changed as slowly as requisite by retarding the valve, D, on diminishing the outlet. 3rd. The entire independence of attention or lubrication.

In this form, as shown in the figures, many of the engines have been at work for twelve to fifteen months, giving not the slightest trouble, and requiring neither examination nor lubrication.

It is by five of these engines that the large organ in the Hall is blown. They are calculated to be able to supply 50 cubic feet of air per second at a pressure equal to a column of water of 6 inches, and when working at full speed develope a power equal to about 8 horses, as calculated by Watt's rule.

ON BOILER EXPLOSIONS.

HOPKINSON'S COMPOUND SAFETY VALVE.

At the late meeting of the British Association, Mr. Joseph Hopkinson, jun., author of the work on the Indicator, published by Weale, read a paper on steam-boiler explosions, and exhibited a compound safety valve designed by him to prevent them. The object of his paper was to show the necessity of increased attention to the form and construction of steam boilers, and of an appliance to prevent explosions in properly constructed boilers; also, to submit an improved valve to the Association. After noticing the hay-stack, wagon, Cornish, and Butterley boilers, he came to the double flue or double fire-box boiler, and spoke as follows:—

This description of steam boiler is now almost universally adopted, and, as we have had bitter experience of its failing, I am surprised it has not been condemned long before now. It is very strange that, although there have been so many explosions from collapse at various pressures both great and small, this form of boiler should have been so relied upon for its resisting powers. I should speak within bounds when I state that this form of boiler has been the cause of more explosions than the aggregate of all the other. And this is easily accounted for, because many parties imagine its power of resistance is almost infinite; but such an idea cannot be too soon dispelled. The double fire-box or flue boiler is formed of three tubes, two lesser and one larger; the two lesser are placed within the larger, and all are bound together by end plates, which ends are flat. The space around these tubes and between the outer shell constitutes the water space and the steam chamber; the pressure, whatever it is, that the steam exerts within the boiler is exerted within the space, that pressure being internal to the large or outer shell, and external to the smaller inner tubes or flues. That pressure also, whatever it may be, is exerted upon the flat ends of the boiler. This form of construction, which I am sorry to say is

the prevailing and apparently favourite form, is not only not safe, but positively and of necessity unsafe; and it follows as a matter of course, that, with the high pressures now worked at, this want of safety becomes in many cases absolute danger, while with all boilers of this construction, and at whatever pressure they may be worked, if that pressure be appreciable, their giving way is but a question of time. The great source of danger in this form of boiler is the inner tube or flue and the flat ends. When pressure is exerted within a tube or cylinder with spherical ends, the tube can only give way by the metal being torn asunder; and the tendency of the strain is to cause the tube to assume the true cylindrical figure or spherical form—the form of greatest resistance. With pressure exerted on the outside of a tube, the tendency of that pressure is to crush in the tube, to flatten it.

It is now a well-known fact, that iron of any strength when formed into a tube will bear a much greater strain to tear it asunder, if that pressure be applied internally, than it will bear without crushing in when applied externally. A bar of iron when used as a tie rod will resist a very large amount of tearing force; but that same bar placed as a prop only under a weight exerted in the former case would be doubled up and crushed out of form. The inner tube of a boiler of this construction is but a series of props placed to sustain the immense weight of the pressure exerted externally to its diameter. The constant and never-ceasing tendency is for those props to give way—for the cylindrical tube to depart from the form of greatest resistance, to become flattened or bulged, and its ultimate crushing in is in the best of cases only a question of time. This, the double fire-box boiler, was invented in America by Oliver Evans, and was for a considerable period, and in some parts is still, known as Oliver Evans's boiler. It was used in America so far back as 1786. Boiler explosions have been by no means uncommon in America, as is well known; indeed, so numerous have they been, and attended with such dire results, that in 1817 a searching inquiry into their cause, with a view to their prevention, was instituted under the sanction of the American Government. In reference to the fire-box boiler, the report presented after that investigation states, "Many respectable mechanics and engineers in this country considered the improved boiler invented by Oliver Evans obviated the objections to high-pressure engines. The late melancholy occurrence on board the *Etna*, in the waters of the New York harbour, is evidence they have been deceived." Mr. Jacob Perkins, in his report on the same form of construction, says, "This form of boiler should certainly be abandoned." Another eminent engineer, Mr. C. J. Jarvis, wrote as follows:—"A flue of this kind may be placed in such circumstances, that, when the steam and temperature get unusually high, it suffers a minute change of form. Under these circumstances it will inevitably collapse sooner or later, according to the extent to which its form is altered at each time it is unusually heated, and the frequency of that occurrence, let it be surrounded with as much as it may." There is no doubt that, providing the flues were strictly cylindrical, their strength would be immeasurably great, but such is not the case, nor is it possible to make one; the very weight of the material itself is sufficient to destroy the true figure of the flue, even providing it were made of one whole plate without rivets or lap joints; but in the ordinary flue, as used in all boilers, the figure of greatest resistance is gone at once, by the overlapping of the plates; and in the case of horizontal tubes, as employed in steam boilers, the pressure is not uniform; for, while the pressure on the top part of a flue three feet diameter may be 20 lbs. per square inch, the pressure upon the under side would be 1½ lbs. more, because the weight of a column of water has to be added to the pressure on the lower part of the tube; therefore the cylindrical figure in that case is not the true figure of greatest resistance; and it is not very likely that in the ordinary business of boiler-making much care or correctness can or will be bestowed to the calculating, or afterwards in the making of the tube, agreeable to the true figure of greatest resistance. We need not be surprised at the explosions which occur from collapse; the very form throughout almost seems to invite the occurrence, and thus it is by a continued working of such a description of boiler, and the always increasing weakness of the flue from its varied pressure and temperatures, and its consequent change of form, that ultimately these explosions occur. Hence the reason why a tube that has been proved to a pressure of 80 lbs. to 100 lbs. to the square inch may afterwards fail under a pressure of less than half that amount. There are other circumstances in connection with this form of boiler which cannot easily be prevented from taking place; see the number of plates which have cracked and given way on the under side of the boiler, from the contraction and expansion caused by the difference of temperature of the top and bottom side of the boiler, and which is materially hastened in

its destruction by the emptying of boilers and then suddenly cooling them by admitting cold water, so as to break off the scale. I have known double fire-box boilers break off in this manner on the under side, both in the line of rivets and even across the plates, from this cause. Look again, for instance, to the time when starting a boiler and getting up the steam, and notice the length of time the water on the under side of the flue is before it is even lukewarm; here, then, is an important action taking place in reference to the safety of the boiler.

The flat ends of this form are also a source of weakness. The reason of this will be at once apparent: the tendency of the force within the boiler is to cause the flat ends to bulge outwards—to assume, in fact, the spherical form; this brings unusual and unequal strain upon the rivets which join the plate together; these at last give way, being either torn out or the plate itself riven asunder across the line of rivets, and then out the ends go. Instances of this kind can be seen in almost every explosion, and in some cases where the plates have been torn asunder, as though it were but paper. When once any part of a boiler gives way the other parts become exposed to unequal strain from the expanding contents, which exercise a tearing and impelling force equal to that of gunpowder. To counteract this tendency of the flat end bulging outwards, it is usual to stay them. Stays at best are but inferior substitutes for the form of greatest resistance. Stays, however, would be of no service applied in a sphere subjected to internal pressure; the power of resistance would be exactly that of the metal to sustain the strain, exerted upon all parts alike. Stays would be of no advantage unless they could be applied so as to strengthen that metal in all its parts; and this, it will be seen at once, could only be accomplished by using metal of greater thickness or strength for the original construction. Boiler stays, therefore, are at all times but an insecure substitute for real strength of construction; but the manner in which they are almost invariably applied renders them still more insecure, and at times positively dangerous, because they incite to the idea of security where it is in reality absent. To counteract the tendency of flat ends bulging outwards, or being blown off with internal pressure, it will be at once apparent, that, if we desired to secure the utmost benefit this stay rod is capable of rendering, we should let it proceed through the end of the boiler, in a direct line with its own length, and then, by means of washers, screws, and nuts, secure it in that place. The strain would then be direct to its own length, and its power of resistance would be equal to the weight applied perpendicular which the rod would sustain without breaking asunder. But stays are seldom thus applied; instead of proceeding through the boiler ends, the stay rods are bent at right angles and riveted to the boiler through the bent parts. The strain, as will at once be seen, is mainly on the bent portions, to straighten them out, instead of the pull being in a direct line to the stay-rod, as would be the case if applied as before described. When we apply tie-rods to a floor or a roof, or to a beam of any kind, we do not copy the mode of application adopted with steam-boiler tie-rods; we apply them so as to receive the full power of resistance against strain or weight, and we ought also to do so in the case of steam boilers. The principle of application appertaining to the gusset stay is precisely that I have just described. It is formed of angle iron, and a gusset of boiler plate; the strain in the case of the gusset stay is on the angles of the angle iron and the rivets by which these are attached to the ends and side of the boiler. The power of resistance is just what these angle irons and rivets will bear without breaking, straightening, or tearing out. It is not by any means the amount which the same metal differently applied would give. Samples of the various modes recited are too palpable when explosions take place.

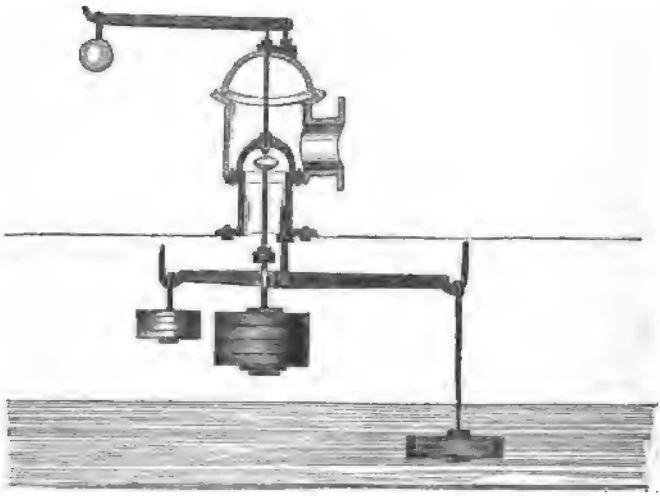
Having now spoken of the unsafety of the double fire-box boiler, I come to what may be termed the immediate cause of explosions. The next descriptions of explosions are those of over-pressure with water at its proper height, which are generally caused by the safety valve being inoperative, inefficient, or miscalculated. Over-pressure is also caused by the safety valve being over-weighted either by the engineer, or from the ignorance of parties tampering with it. Numerous have been the accidents from this cause, and parties have been so reckless and regardless of the consequences to themselves and others as to sit upon the lever of the safety valve and cause explosion. Over-pressure combines so many circumstances that it would of itself prove to be the real cause of explosion.

Explosion from deficiency of water is the immediate cause of a majority of steam-boiler explosions. Firstly and simply the cause of deficiency of water is evaporation, which leaves the naked plate to the action of the fire and weakening the boiler, which becomes over-heated, and unable to resist its ordinary pressure. In some instances water has been admitted to the boiler when the latter was in a heated state, and explosion has then occurred. Deficiency of water also has taken place from the pumps getting out of order, dirt getting into the

pipes and valves, and the engineer being deceived by the sticking of the float-wire, from wear in the packing, and very frequently from the erroneous indications of the glass gauge, caused by the stoppage of the thoroughfare to the boiler, or the taps being tampered with; and, in cases where gauge taps only have been in use, the engineer has been deceived when, on opening the tap, the water has primed and come out, even when deficient in its height in the boiler; and there have been several instances of late of diabolical acts, such as letting out the water during the night, and on Sabbath days, but happily the parties were foiled in their attempts at injury, the boilers being provided with proper fittings, such as I shall hereafter describe. Another instance (on an engineer leaving his situation) was a bunch of small wire being put into the suction pipe of the boiler pump. It worked for a short time, until the dirt and fibrous matter increased the stoppage. The boiler became deficient in water during their working in the night time, and in this instance both injury and explosion were prevented by the same apparatus. There are instances also of the corrosion or wear of working parts. An occurrence of this kind happened at the Bradford Iron Works, near Manchester, and, although the boiler was provided with a fusible plug, four persons were killed. Another explosion took place at Red Bank, where also a fusible plug was inserted in the boiler. I may mention this fusible plug has been before the public for thirty years, and the very many explosions having occurred when adopted should have been a sufficient proof of its inefficiency.

Open stand pipes are also greatly recommended for the prevention of explosions, but these also have been a source of many accidents, because they have incited to the idea of safety, have caused neglect, and of themselves have been the cause of explosions. A more treacherous apparatus could not be applied. Over-pressure, deficiency of water, coupled with inattention and ignorance, have been the principal causes of explosions, and I now propose to show you the patent compound safety valve, which is a preventative against explosions from the causes before enumerated, and the explosions which have taken place from all causes excepting that of a defective boiler, as under all other circumstances steam-boiler explosions are rendered impossible.

[By the politeness of Mr. Hopkinson we are enabled to illustrate the present paper with the annexed engraving, made from a drawing with which he has favoured us.]



The patent compound safety valve introduced by me, comprises two distinct valves, a large 5½-inch diameter valve with flat face, and a spherical or ball-faced valve 3 inches diameter, the smaller or ball valve seats upon the centre of the larger one, as shown in section. It will be seen the larger valve is weighted by means of a lever and ball, as in the common safety valve; there is an iron bridge or cover casting which fits to the large valve and forms the centre for the centre-pin to give pressure upon the valve enclosed; and resting upon the centre of the large valve is the ball-valve, which is weighted by a dead weight inside the boiler, the dead weight being comprised of iron-plate castings. When the steam exceeds the pressure this ball valve

is weighted to, it escapes through the openings in the bridge casting into the dome or shell and out into the atmosphere. As soon as the ball valve lifts from its seat, the large one also lifts from its seat, and thus a double discharge is given to the excessive steam. The feature here presented is of importance, inasmuch as we find a valve possessing an opening or discharging area, equal to an ordinary safety valve 8½ inches diameter. The valve cannot be weighted beyond its working pressure whilst the boiler is at work, as it will be seen; should an attempt be made to weight the lever or even press upon it with all force, that would be useless so long as the ball valve was there; and even should the ball valve be weighted intentionally whilst the boiler is standing for cleaning, &c., it may instantly be detected by placing the ball on the lever in its ordinary working place, and by getting up the steam you will discover such tamperings, and to what extent, by the marks on the lever; yet when the boiler is at work it defies any tamperings, The steam can be blown off, as with any other valve. Here, then, is shown the advantage of this valve over the ordinary steam safety valve. Turning now to the next feature, we come to its improved arrangement for deficiency of water. There is a lever suspended in the boiler; the rod which bears the weight for the ball valve passes through a large hole in the centre of this lever. On this rod is fixed a collar, which is arranged so as to allow the lugs of the lever to come in contact with it as before mentioned. There is a lever or beam suspended in the boiler, one end of which bears a large float, the opposite end a balance weight to counteract the buoyancy of the float when immersed in the water, and to keep the tip of the lever up against the under side of the top of the boiler; the float is immersed in the water to such a depth as is called low-water mark. When the water begins to leave the float, the specific gravity of the float is then brought upon the end of the lever, which turns upon a centre; the lugs then are brought into contact with the collar on the rod, and the valve is raised from its seat. Should the water still get lower the valve continues to rise, and will do so until the water be again at its proper height. Should the warning be disregarded, the steam will all be discharged from the boiler, and stop all working, and render explosion impossible. There is timely notice given of such deficiency by the continual lifting of the valve from its seat, and, if not attended to, it will open to its full extent. The advantages are as follows:—Its combination of parts so as to act for excessive pressure and deficiency of water; its general mechanical and practical arrangement, possessing neither spindles, guides, rubbing surfaces, nor parts liable to stick; simple in construction and certain in its action; can be used as any other valve is required for general working, but prevents the careless, the ignorant, or the wanton from causing either injury to boiler, or boiler explosions; is not liable to derangement, and is in every detail what a safety valve ought to be.

ARMSTRONG'S PATENT TIME AND PERCUSSION FUZES FOR ORDNANCE.

MR. ROBERT ARMSTRONG, C.E., of Newcastle-upon-Tyne, who has already done much toward the improvement of ordnance, has just completed a patent for a time fuze, in which the fuze composition is lodged in an annular groove, the continuity being broken by a stop, on one side of which the fuze has its commencement and on the other its termination. The duration of the burning of the fuze is regulated by causing it to be ignited either at its commencement or at some intermediate point between its commencement and its termination. This is effected by means of a revolving cover furnished with a tightening screw to fit it at any particular point, and containing a passage through which a jet of flame is directed upon the place where the burning of the fuze composition is intended to commence. This jet of flame is produced by the flash of a detonating composition which is contained in the body of the fuze, and is fired by the penetration of a point actuated by the force exerted on the projectile at the instant of firing the gun. His invention also embraces a percussion fuze for causing the shell to burst upon striking an object, in case the striking takes place before the time fuze has operated. For this purpose he employs a weight or striker contained in a cylindrical case within the shell. In this cylindrical case the striker is fixed by a pin which passes through it and the sides of the case, and which is cut or broken by the shock which the projectile receives in the gun at the instant of firing. The striker, being thus liberated by the act of firing the gun, recedes to the bottom of the case, and there remains until the velocity of the shell is checked by coming in contact with an object. When this takes place, the striker, not participating in the retardation of the shell, advances in the case, and causes a patch of detonating composition to be carried against a fixed point, which fires the composition and ignites the bursting charge in the shell. This method of causing the shell to burst on striking an object is designed for explosive projectiles having a

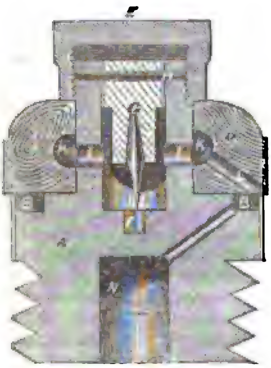
constant, or nearly constant, axial direction in their flight, and it may be applied either with or without a time fuze.

Fig. 1 of the annexed engravings is an elevation of the time-fuze complete; fig. 2 is a vertical section. A is the body of the fuze screwed to fit the shell. B is the annular groove filled with the fuze composition, its continuity being interrupted by a

Fig. 1.

stop. The fuze composition is applied as a powder, and is consolidated in the groove by pressure. The composition thus compressed is covered with paper on its external circumference, as well as upon its upper surface. D is a circular cover arranged to revolve on the body of the fuze. E is the cap or tightening screw for fixing

Fig. 2.



the circular cover in any desired position. F is the detonating composition contained in a cavity in the body of the fuze. G is a pellet, or striker, armed with a point. This striker is secured in its position until the shell is fired from the gun by the pin, H.

On the firing of the gun the striker exerts by its inertia a resistance to the motion imparted to the projectile, and the pin, being of inadequate strength to overcome the resistance, is cut or broken; the striker, being thereby freed, penetrates with its point, and ignites the detonating compound. The flame produced by this ignition fills the chamber containing the striker, and, passing thence by two apertures, I, I, into the annular space, K, within the circular cover, is finally directed through the passage, L, or on to the fuze or composition, which it ignites through the covering paper.

From the point of ignition the composition burns in opposite directions towards the stop. In one direction no effect is produced, the burning being terminated by the stop, but in the other direction the flame, on reaching the stop, communicates by means of the passage, M, filled with gunpowder, with the chamber, N, also containing powder, the explosion of which fires the bursting charge in the shell. The chamber, N, may be closed by a plug, or by any other suitable means. The body of the fuze is surrounded by a graduated scale for guidance in regulating the length of the fuze, which scale has for its zero the termination of the fuze composition at the passage, M. In order to regulate the fuze the tightening screw, or cap, is slackened, and the circular cover then turned until the passage, L, coincides with the point indicated by the scale for the required range, at which point it is fixed by the retightening of the screw cap.

Fig. 3.

Fig. 3 shows a section of a percussion fuze. O is a cylindrical case, P the cover of the same, having a point projecting inwards fixed in its centre. Q is a weight or striker, fitting the case, and maintained in its position by the pin, R, passing through it and the sides of the case. S is a cavity in the striker, containing a detonating composition.

ATLANTIC TELEGRAPH INSTRUMENTS.

A BRIEF DESCRIPTION OF THE INSTRUMENTS EMPLOYED ON THE OPENING OF THE ATLANTIC LINE.

BY E. O. WILDMAN WHITEHOUSE, ESQ.*

THE instruments made use of may be classed under the following heads:—

1. The batteries.

2. The induction coils.

3. The manipulator, or transmitting apparatus.

4. The relays and instruments employed to receive the signals, including a new reflecting galvanometer, by Professor Thomson.

5, and last. The apparatus for recording by electro-chemical decomposition.

The battery employed consists of platinised graphite, or retort coke, and zinc of large surface, excited in the usual way, 8 to 12 cells being used as may be required.

The coils are used in pairs, and consist of large hollow iron cores, 5 feet in length, and each wound with the following lengths of copper wire:—

1. With about 11,000 yards of No. 20 gauge silk-covered copper wire, for a secondary circuit, insulated with wax paper between the layers, and hermetically enclosed in gutta percha. And over this a primary circuit of thick wire, No. 14, consisting of 24 parallel circuits of about 100 yards.

3. The key, or transmitting apparatus, consists mainly of a large commutator, or current reverser, kept in constant motion by a train of wheels, and giving regular alternate primary currents to excite the coils; and, by mechanical arrangement and simultaneous action, the shocks from the secondary circuit are sent into the line, and would thus produce a regular succession of marks or dots at the distant station.

Two ivory studs, for hand manipulation and control, are so mechanically arranged and connected, that the tender may, without in any way interfering with the generating part of the commutator, convert these signals into dashes or pauses at will, by the mechanism connected therewith for modifying or entirely diverting or short-circuiting the secondary currents.

4. The relays, &c.

The currents thus generated and controlled are received at the distant end upon a galvanometer, or relay, so constructed and connected with a local printing battery, as that every movement shall record itself, by means of a steel stile, upon a slip of electro-chemical paper, kept in constant motion.

The first signals and messages received from Newfoundland were worked off by them, and received by us, precisely in this manner, although, even then, several days having elapsed since the laying of the cable, injury from exposure had begun to interfere with the currents.

Professor Thomson's galvanometer being placed in circuit for the visible examination of the currents so printed, and showing their peculiarities very beautifully, I placed near the observer's hand a finger key by which he might record the indications of this instrument by a second stile on the identical strip of paper which we were using, several of which slips, containing these records, made for comparison, I now lay before the Section.

Satisfied with the accuracy of the instrument, and with the facility with which we could thus convert its visible signals into indelible records, on the further diminution of the strength of currents from increasing injury, I preferred it to the relay; more especially, because with feeble signals and a varying zero, produced by terrestrial currents, it was capable of being more easily and more accurately used than any form of relay possibly could be.

The eye could easily distinguish the alteration of the zero, and could as easily read off the signals with a constantly varying zero as with the most perfect steady one.

Since the final interruption of intercommunication they are still able to send us signals from their coils, which this instrument, from its delicacy, can distinctly appreciate; were this known to them at the time, they might as easily send us actual words.

The fact of the fault being at this end impeded from the first to a much greater extent the transmission of our signals to them; we were very early obliged, therefore, to abandon the use of our special apparatus for speaking, and to rely upon voltaic currents of low tension, with contacts of long duration, in order to produce on their instruments any available signal. And even with this arrangement, they were reduced to reading our despatches by movements of only half a degree upon their most sensitive detector.

* British Association, 1858.

THE MANUFACTURE OF IRON.—We observe that the improvement in the manufacture of iron pointed out by Mr. Armitage in his paper inserted in our last Number—viz., the fusing together of iron in combination with steel—has been patented by himself and Mr. Henry Lea, of the Farnley Iron Works.

ELECTRIC TELEGRAPH INSULATORS.

EFFECT OF TEMPERATURE ON THE INSULATING POWER OF GUTTA PERCHA.

BY E. O. WILDMAN WHITEHOUSE, ESQ.*

A PARTICULAR juncture in the manufacture of the Atlantic Cable at Greenwich afforded the opportunity of making some observations on the effect of temperature in a very satisfactory manner.

Being early in May, the days were bright, with clear, still sunshine, while the nights were cold and almost frosty. A new length of cable was begun at this time, and, as it passed through the composition which strongly blackened its surface, was laid out in the open air, and raised from the earth by thick deal boards.

It was therefore in a condition, during the manufacture of the first layer, the most favourable for observation of the effect of any change of temperature which the weather might offer.

For several days this was made the subject of very close observation, and for thirty-six hours, during which the conditions seemed the most favourable, it was observed, and the results recorded every few minutes.

The Company did not at that time possess a Daniel's battery of sufficient number of cells to produce any apparent loss in so short a length of perfectly insulated cable. I therefore used the ordinary zinc and copper couples, filled with sand or sawdust, moistened with dilute acid, in the usual way, in number 500. Care was taken to maintain its greatest uniformity of action.

The loss was read off in degrees upon a horizontal galvanometer of great sensibility, and the degrees of deflection marked off on a vertical scale. The amount of force represented by those degrees can be determined and laid out in similar form when the galvanometer shall have been properly examined and graduated for that purpose.

The temperature is also laid down on the same vertical scale in degrees of Fahrenheit; two red lines denote the readings of thermometers in the sun and shade respectively, and time is marked on the base line.

The effect even of a passing cloud upon the insulation could be noticed on the instrument. An obscuration of the sun for some minutes produced a fall of several degrees, while a few drops of rain, falling about noon, reduced the deflection from 70½ to 54½; and the deflections ranged altogether from 71 to 1½, with a temperature ranging between 74° in the sun, and 39½° at night.

These observations were followed up by some experiments at the gutta-percha works, upon a length of 2,000 yards of Atlantic cable, immersed in water of varying temperatures. The results were read off upon the same instrument, and fully confirmed this remarkable influence of temperature on the insulating power of gutta percha.

* British Association, 1858.

CAN A SUITABLE INSULATING MATERIAL BE FOUND POSSESSING A LOWER SPECIFIC INDUCTIVE CAPACITY THAN GUTTA PERCHA?

BY E. O. WILDMAN WHITEHOUSE, ESQ.*

THE amount of induction and consequent retardation in submarine wires—other conditions being alike—would seem to depend so greatly upon this property of the insulating sheath, that it would be most desirable that some experiments should be made with the object of determining this point.

A substance, or rather solution or compound, suggested by Mr. Statham, and recently perfected and adopted at the gutta-percha works—with which the wire is coated, before it receives the gutta percha—will be found, if I mistake not, to be a step in this direction, while at the same time it enhances largely the perfection of the insulation.

It still might be an object of legitimate research to discover some substance of very low specific inductive capacity, which shall possess all the mechanical and chemical properties requisite for this purpose.

PROMOTIONS IN HER MAJESTY'S DOCKYARDS.

As we are not among those who deem it a very patriotic thing to be perpetually falling foul, with or without reason, of either the Admiralty or any other department of the public service, we hope we shall be listened to when a positive evil so forces itself upon our notice as to compel us to openly oppose it. It is with this hope that we are now about to make public a few facts in connection with the method by which promotions are, and have for some time been, distributed in Her Majesty's dockyards. The evils that we have to complain of are widely removed from those systems of nepotism and political favouritism

* British Association, 1858.

of which the country has lately become so weary; for never, we believe, was the patronage of the Surveyor of the Navy administered with so entire and absolute a freedom from biases of that kind as it has been while Sir Baldwin Walker has filled that office. It is, on the contrary, the perversion of a system instituted to secure that most desirable end, promotion by merit, that we have to oppose—a perversion which, although it has in all probability proceeded from nothing worse than neglect, is, nevertheless, most unfair and injurious in its results.

The immediate occasion of these remarks is the circumstance that a number of offices have lately fallen vacant in the dockyards, and are about to be filled by promotions from lower grades. No less than three master shipwrights (nearly one-half of the whole number of them), at salaries of about 650*l.* per annum and residences, and at least double that number of foremen, at salaries of 250*l.*, have lately vacated their posts, either by retiring upon superannuation allowances, or by rising to higher positions. There is, consequently, a large number of posts to fill, and promotions to be made, from every grade of shipwright officers in the service. It is, therefore, of great importance just now that the system upon which these promotions are distributed be a just one, and one calculated to secure the efficient conduct of the mechanical department in question.

A few years since it was resolved by the Admiralty that promotions in the dockyards should be determined upon exclusively by means of an examination test. The consequence has been that many good, sound, experienced men, who possess every essential qualification for higher offices, and particularly those qualifications which are most essential, but whose educational advantages in youth were not so good as those now existing for youths—many such men have had every chance of advancement ruthlessly taken from them. Their hardly-earned and well-matured experience has been esteemed of much less value than a mere smattering of algebra and Euclid; at any rate, men with the latter only have carried off as *prizes* those offices which should have been the legitimate *rewards* of older and better men. This has arisen from a too hasty and wholesale application of the competitive principle. In a few years' time, when all have had equal chances, and when experienced and deserving men have been fairly dealt with, the principle will probably be the best possible in its application. But its sudden and unreasoning introduction has been, and still is, fraught with injustice to individuals and mischief to the service. Surely a portion—say, one-half—of the vacancies that occur might be reserved for those whose manifest claims are so strong that mere school-like examination should be waived in their favour! Surely those mature men, whom all superior officers agree in pointing out as the proper men to be advanced, may in all justice be served without being exposed to the pain (which some are too proud to bear) of having to sit at desks, and compete in matters of mere book-knowledge, with youngsters in every other sense their inferiors!

But even the competitive system, bad as its indiscriminate application is, has degenerated in its application to dockyard promotions. It has come to consist of two rules, both of which are bad. The first is, that every man before he can be promoted must be examined, which is what we have just been discussing; and the second is, that every man who is examined must be promoted! It seems an astonishing thing that so absurd a rule as this last should have come into vogue; but it has. We speak entirely from our personal knowledge of the facts of the matter. If a vacancy has fallen out and three men have been examined, at their own request, as candidates for it, the best of the three has been made at the time, and the other two have had the next vacancies given them, whether they did much or did nothing at the examination. No other men can be advanced, no others are even allowed to compete for advancement, until these two are served. The consequence is, every ignorant, pretentious man may get promotion, whereas men of true ability, who from their very honesty and manliness refuse to compete at bugbear examinations, get none. So that the competitive system has been unconsciously permitted to become a means of depriving modest worth of all hope, and of making the merely impudent successful. At the present moment there are individuals who have attended examinations, but have done next to nothing there, who are yet confidently expecting promotion to higher offices, which some better men undoubtedly deserve, and which others are perfectly ready to compete for. Such an arrangement is in the highest degree detrimental to the service, and calculated to destroy the *morale* of the men and officers of the department.

Other evils attend the present mode of applying the competitive system in the dockyards, to which we can at present refer but briefly. The chief is the loose and unsatisfactory manner in which examinations are arranged. A few months since, a master sailmaker was appointed as the sole examiner of two candidates, one of whom was of the same rank as himself. Shortly

after, the same person, although a man of very scanty education, was appointed to examine, among others, a man trained at the late Admiralty Scientific School at Portsmouth, at an expense, probably, of about £1,200 for the three years of his training, and, as might have been expected, the efficient man was not recommended. Such an arrangement is preposterous. It is a mere farce, and not a very amusing one, to expend a large sum of money in teaching a man the higher branches of his art, and of the sciences on which his art is based, and then to send him for examination to a person who knows nothing whatever about such matters, and to accept his report as decisive. The manifest effect of such a proceeding is, in plain truth, to give to the examiner in question that very patronage which all are so anxious to do away with. For our own part, we would much prefer to see it exercised, if exercised it is to be, by the Surveyor of the Navy himself. But a proper selection of examiners would remove the difficulty. We have other facts in our mind relating to this subject, but we must defer noticing them for the present.

SHIPS' PUMPS.

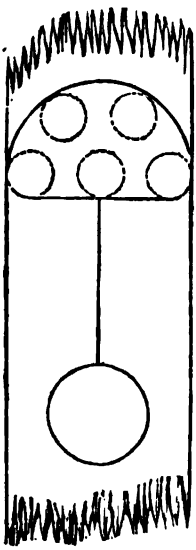
To the Editors of the Mechanics' Magazine.

Gentlemen,—It is generally found in scientific discussions that, when facts are strong, laboured attempts to be witty are but seldom made; but, when facts are weak, and the case nearly hopeless, persons are compelled to brush up their wits (if they have any), and sometimes to descend to personalities and forms of abuse. This appears to be the case with your correspondent "J. S. H." I quite agree with you, Sirs, that this pump controversy is of immense importance, when we are hearing of hundreds of people lost at sea by fire, as in the case of the *Austria*. And, further, discussions upon pumps, if conducted in a proper spirit, must do good; still I must declare my conviction that no benefit to science can result from such letters as that in last week's *Mechanics' Magazine*, under the above signature. It can never be just for a person to take a small portion of a paragraph from a letter, and then twist it into a confession of defeat—a construction that no person who has the least pretence to honourable feeling, and who has read the whole of the correspondence, would put upon it. If your readers will turn to No. 1831 of the *Mechanics' Magazine*, page 253, they will find the following in Mr. Stone's letter:—"It is untrue that Roberts's pump was worked so badly that eight men at one time did no more than six at another." The answer to this is on the next page, in the second paragraph of my letter. In beg your readers to read the whole paragraph, and judge for themselves, how far "J. S. H." is justified in twisting it, as he has done, into a confession on my part that eight men at my pump *cannot* do as much as six at Downton's. Why, Sirs, if "J. S. H." knows anything about the trials, he must know that during the whole twelve months over which they extended, and as long as the pumps were fitted as used in the service, my pump, although worked with the minimum number of men, was invariably from 20 to 30 per cent. superior to Downton's, and on one occasion was nearly 2 to 1 in my favour; that, in taking them to pieces to clear the valves, mine was to pieces and in working order again in 1 min. 50 sec., while Downton's was not in working order in 10 minutes; and that my pump was taken out of the ship, placed in the pinnace, and in full play as a floating fire engine in a quarter of an hour, and returned to its place in 10 minutes, whilst Downton's could not be moved at all. He must also know (if he knows anything about it), that it was after Downton's delivery and suction had been enlarged from $3\frac{1}{2}$ to 4 inches, or one-third larger, mine remaining $3\frac{1}{2}$ inches as before, that the $1\frac{1}{10}$ per cent. (not 33 per cent., as he calls it) was gained. I fearlessly refer to the gentlemen who conducted the trials for confirmation of this. Now, Sirs, having shown that the nearest approach to 33 per cent. gained was on my side, if "J. S. H." pleases, we will just reverse the names, substituting Roberts's for Downton's, and his calculation in the third part of his letter will be nearly correct.

As I intend to send you a sketch of both pumps, so that your readers may judge for themselves, I shall say but very few words about the next two paragraphs. With regard to them, I would advise him to get the "good work on hydraulics," and study it attentively, and he will perhaps find he has been floundering rather out of his depth. With regard to the personality of the next paragraph, if "J. S. H." is a gentleman, I am sure he must be ashamed of it. I certainly exceedingly regret that I omitted to carry the 1 from the 2 in my addition, but I venture to think this might be done by any other person: and even this mistake will scarcely alter the relative values, as the same figures were used in both cases. But, Sirs, there is an old proverb, that "those who live in glass houses should not throw stones." And certainly "J. S. H." ought to be the last person to pick up a "*Stone*." Will he please inform us how long 20 per cent. has been one-fourth, or, still worse, how long 10, the difference between 80 and 90, has been the fourth part of 80 or 90?

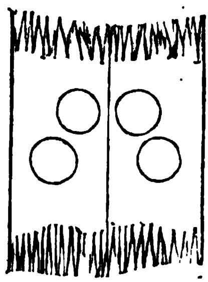
And now with regard to the last paragraph (which, by the way, is almost a verbatim copy of part of Mr. Stone's last letter). He says, "The use of a suction plate is to enable you to take away your pump without disturbing the many suction pipes," &c. Now as I have proved that I can disconnect my pipes from my pump within four minutes (there being only four fly-nuts to unscrew), and connect them again within five minutes, I think this must fall to the ground. Again, they say, "With the pump in one piece and the suction plate in another you can have the two *small* holes in different parts of the deck, whereas with the plate cast on you must have one *large* hole—a thing sometimes of serious importance." This proves either that they know nothing about the subject upon which they have been writing, or that they have been wilfully trying to mislead you and the public. And now for the proof: in the first place, the suction plate was designed to enable one pump to do the work of four or five, and, for the benefit of your non-professional readers, I will de-

Fig. 1.



scribe its action. In the centre of the plate is a hole, and round it at equal distances are several others; from the central hole a pipe leads to the pump, and from the other holes pipes to different parts of the ship. There is a bent pipe called a "goose neck," which is made so that the ends agree with the central hole and those outside. It also carries the foot valves or lower-box (without which the pump is incomplete). By screwing one end on to the pipes leading to the pump, and the other into one of the pipes leading into the ship, communication is made with that part. To shift it, it has to be unscrewed, shifted round, and screwed upon another pipe. Now, as four holes are the usual number used, to fit a suction-plate, either you must have five holes as shown by the dotted lines in fig. 1, or one large one as shown by the drawn line, and one more for the pump as shown below in fig. 1. But with mine, there being no central hole, it is only necessary to cut four holes

Fig. 2.



as in fig. 2, and the communication is instantaneously shifted by simply turning the plug in the centre of the plate. I think I have now proved my assertion, that "J. S. H." does not know what he has been writing about. I would, in conclusion, advise him, before he talks about pledging his credit as an engineer, to sign his name, that we may know whether his credit is worth taking in pledge. I am, yours &c.,

WILLIAM ROBERTS.

Millwall Cable Works, Oct. 19, 1858.

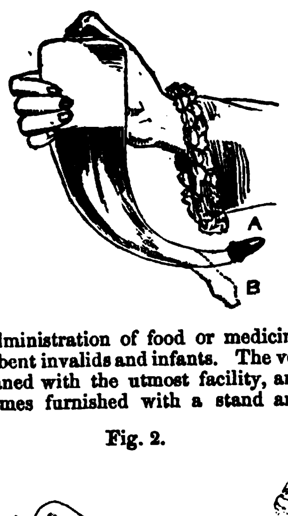
P.S.—By referring to the sketch, fig. 1 (which is on a scale of ¾ in. to a foot), it will be seen that, if the streaks of deck are 8 in. wide (the usual width), two planks will be cut quite across by Downton's suction plate, necessitating the fitting a broad carling underneath to support them; but in my case, fig. 2, the deck is comparatively uninjured—truly a very different story to that told by Mr. Stone and your correspondent "J. S. H." The sketch is taken from a 7-in. Downton pump, and one of mine of equal capacity. W, R.

THE TONNAGE COMMITTEE.—With reference to our remarks upon this Committee in our last Number, we think it desirable to state that Mr. Wright was selected to act as Secretary to the Committee, and his name was therefore very properly placed upon the list of members, with the capacity in which he was to act duly indicated. We by no means desire, therefore, to cast any reflection upon his appointment.

EDWARDS'S PATENT CORNUCOPIAN FEEDERS AND VENT-PEGS.

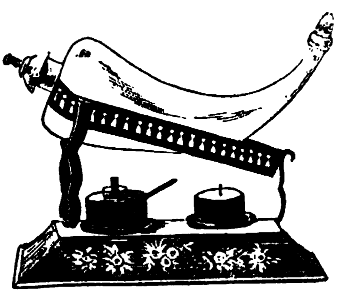
Mr. Henry Edwards, of Bishopsgate-street Within, London, has recently patented and introduced a new form of vessel, which, while it serves admirably as a feeder for infants and invalids, is also of great value as an instrument for administering medicines. The object of the invention is to prevent air being sucked in with the infant's food, or other article administered, and this is accomplished by forming the vessel somewhat like the cornucopia, as illustrated in the annexed engraving. The orifice, A, fig. 1, from which the fluid or semi-fluid contents are drawn is, as will be seen, entirely covered on the inside therewith, so that air and fluid cannot be drawn out together, as they are when the fluid rises only to the level of the orifice. The end A is, in some cases, turned down as indicated by the dotted lines at B, fig. 1, to adapt it the better for

Fig. 1.



the administration of food or medicine to recumbent invalids and infants. The vessel is cleaned with the utmost facility, and is sometimes furnished with a stand and a

Fig. 2.



lamp, to keep the contents warm by night or day. The stand may be variously modified, and sometimes is heated by a hot plate, and used to keep the contents of other vessels warm, as shown in fig. 2. When used as a medicine glass, mixtures may be taken without imparting either taste or odour to the invalid. A larger kind is also used for administering medicine to cattle and other inferior animals.

Mr. Edwards has likewise introduced a spring air-stopper, to be used for regulating the flow of fluids from his feeders, which may also be modified and used as a vent-peg generally. It is also well adapted for smelling salts and perfume bottles. As a vent-peg for wine, beer, or spirit vessels it is of great value, being formed entirely of india rubber, and therefore unsusceptible to corrosion. The cornucopian vessel, fitted with the improved vent-peg, serves excellently for an oil lubricating vessel. By simply pressing down a central pin in the peg with the thumb, access is given to the air, and the oil is allowed to flow; by raising the thumb the flow is instantly stopped.

The utility of these inventions, simple as they may appear to some, is very great—so great that, although they are both patented, some not very scrupulous or prudent persons have commenced to manufacture articles in imitation of them.

TELEGRAPH CABLES.

Gentlemen,—It appears that I am not singular in the idea that submarine electric wires should be longer than the cable by which they are protected; and that the same proposition should emanate at about the same period from three distinct quarters, is, perhaps, a recommendation in its favour. Since forwarding to you my communication of the 4th inst., I have seen the *Builder*, which contains an editorial article, embodying a plan analogous to that described by Mr. Archer. It is suggested that the wire should be placed round a rope in a spiral direction, the rope forming the nucleus of the cable; but, assuming this rope or cylinder, as Mr. Archer has it, to be half an inch in diameter, the wire, on being coiled round it would be from two to three times the length of the cable, and this great length would cause a serious retardation in transmitting electricity. It was, perhaps, with a view of avoiding this evil that Mr. Archer proposed to coil the wire only at intervals; but, should a strain occur between the coils in paying out the cable, the coiled portion of the wire would not save the other part from injury It will be seen that by coiling the wire round a slender mandril, so as to give it an

elongated spiral form, its length would not greatly exceed that of the cable; yet, even if but ten per cent. longer, that length would protect it from the effects of any strain to which the cable might be subjected, short of breaking; but the reason why a slight additional length would protect the wire would be through being placed loosely in a tube, thereby having freedom to stretch an indefinite distance beyond the portion of the cable which might be strained. I think that, although the end which Mr. Archer had in view is identical with mine, the two inventions are so far distinct that, had both been patented, both patents would be valid. Neither plan, however, will be adopted for some years. The second cable for the Atlantic will be constructed on the old principle, with some slight modifications. In other words, the new cable will be another Leyden jar, through which messages may possibly be transmitted at the maximum rate of four words per minute; but, in a few years, after another million has been wasted in experiments, it will be seen that, by means of a tubular cable, electricity would flash through a wire laid beneath the waters of the Atlantic as rapidly as if suspended in the air.

Perhaps the principal cause of the failures which have taken and will take place before the Atlantic is bridged by means of an electric wire is, that the individuals who guide this gigantic undertaking are either electricians who are not engineers, or engineers who are not electricians. This, however, in the infancy of the science might be expected; and if, as it has often been asserted, and failures are calculated to teach, there are many engineers and electricians who are yet destined to teach some valuable lessons to the world.

I am, Gentlemen, yours, &c.,

JOHN DE LA HAYE.

New Bailey-street, Salford, Manchester, October 18th, 1858.

[We would add a word or two to the above letter of our correspondent. It should be remembered that, whenever electricity is passed through a coiled wire, the tendency which it has to pass *directly* disposes it to leap from one turn of the wire to the adjacent one, and so on from turn to turn throughout the whole conductor, instead of passing spirally along the wire; and this leaping is, of course, accompanied by a considerable increase of resistance. This cannot, it is true, exceed the resistance which it would meet with in following the spiral direction of the wire, but it is, nevertheless, much to be deprecated. The best arrangement of conductor for a light submarine cable which has yet come under our notice is one recently submitted to us by Mr. Allan, in which a central straight and strong copper wire is surrounded by a series of fine straight steel wires, which materially add to the strength. Any light cable may be paid out with but little strain, but what little there is must be borne by something, and we know of nothing better than such an arrangement as this.—EDS. M. M.]

GUTTA-PERCHA INSULATION.

To the Editors of the Mechanics' Magazine.

GENTLEMEN,—Having suggested in your columns that the enormous pressure on a deeply submerged cable may have injured the insulation of the Atlantic Telegraph, I am obliged to Mr. Samuel E. Phillips for the information which he gives both to myself and the public, when he states, in your Number for October 16, that "Mr. Whitehouse has subjected not only perfect samples but lengths of Atlantic core made expressly faulty in various ways, to test the principle of increased density in pressure to the *utmost* degree; and, with the enormous pressure of five tons to the inch, no harm whatever to the insulation took place." I have only to ask for what length of time pressure was kept up? If, as I suggested, the deep-sea pressure caused the gutta percha to receive aqueous particles to such an extent as ultimately to impair the insulation, it does not follow that such an effect would take place very speedily, nor does it follow that it would be very perceptible in short pieces. I ask for facts, and trust that I am quite open to conviction.

I am, Gentlemen, yours, &c.,

J. PITTER.

17, Upper George-street, Greenwich, Oct. 16, 1858.

TELEGRAPH CONDUCTORS.

To the Editors of the Mechanics' Magazine

GENTLEMEN,—I have been not a little amused at the chivalrous conduct of an electrician's assistant signing himself Samuel E. Phillips, in your last Number. From the correspondence of the name with that alluded to in Mr. Whitehouse's defence, I presume that he is the confidential clerk whom the Atlantic Company dismissed without a character, unknown to his loving master and true. They appear both ground up in the same mills, if not to the same extent in electrical science. As to the *veteran* electrician who combated Mr. Whitehouse's views, and then cried *Peccavi*, and joined the Atlantic Company as Director,—he has

gained nothing thereby but the satisfaction of seeing Mr. Whitehouse's schemes fail, and having his own apostasy punished by the loss of his capital. Better for him, perhaps, if he had had a little more faith in his theory of electro-motive force and resistance, and had stuck to his notion that Mr. Whitehouse's cable would have been six times better if it had been six times larger, and six times better still if six times larger still.

But I will not, Gentlemen, waste your time and my own in exchanging blows with Mr. Whitehouse's valiant shield-bearer, who is evidently no electrician, as the cause of science is not likely to be promoted by raillery; I must, however, give him full credit for being a faithful clerk.

I am, Gentlemen, yours, &c.,
A Telegraph Engineer.

STIFFENING AND DRESSING MATERIALS.

To the Editors of the Mechanics' Magazine.

Gentlemen,—I have noticed in your Magazine of the 14th August last, in the "List of Specifications recently filed," the following, viz.:—

"Booth, T. Improvements in the treatment of certain vegetable matters, and in the application of the same to sizing, stiffening, dressing, and finishing textile fabrics, and which is also applicable to thickening colours for printing. Dated Dec. 30, 1857. (No. 3188.) This patent consists, first, in treating amylaceous materials in the dry state with oxalic acid, or other acids having a similar effect; secondly, in the application of vegetable materials so treated for the purposes above named."

I have no hostility to Mr. Booth, or to any other person, seeking protection for any legitimate object, either of original invention or improvement, but, as I have for many years employed acids in the manufacture of starch, British gum, dextrine, gum substitute, gum starch, &c., and supplied all the leading calico printers, &c., for years; and knowing also (as I have no doubt Mr. Booth does too) that acids and alkalies have been in use amongst starch, British gum, dextrine, &c., makers generally for years, it appears to me rather too unreasonable for him to seek to engross to himself not only oxalic acid, but, as he phrases it, "other acids *having a similar effect*," when he must know that sulphuric, muriatic, nitric, and acetic acid, as also caustic alkali, produce "a similar effect," have been so employed for many years, and continue to be.

Had he searched at the Patent Office, or read any of the chemical works on Chemistry applied to the Arts, he would have found the truth of what I say; and, moreover, many patents taken out, and in operation, by Berger, Orlando Jones, James Coleman, Emanuel Herze, &c., &c., for the employment of the acids and alkalies in the manufacture of starch, dextrine, &c.

The last, namely, "Emanuel Herze—Improvement in the manufacture of dextrine, sealed 27th September, 1839," in his specification recorded in full, I think, in your Magazine of that period. It was for the use of dilute "nitric acid" in making dextrine from "farina, flour, or starch." This patent expired in 1853, and of course became the property of the public. The postage-stamps, envelopes, &c., have been gummed with dextrine made with acids for years. It has been and is used also for sizing, stiffening, dressing, and finishing all kinds of fabrics, thickening colours for calico printing, &c. Dilute sulphuric acid, &c., is also used in making sugar from potato starch, the first product being dextrine. In fact, dextrine is the first product when these acids are employed upon amylaceous substances, and they have always been so used for years. Upon what pretence, then, can this gentleman seek to monopolise to himself the use of these acids in the treatment or manufacture of amylaceous substances, to the manifest prejudices of starch, British gum, dextrine, gum substitute, and gum starch manufacturers, who have so long used them, and the public also? I hope, therefore, you will interpose your powerful influence in exposing such injustice.

I am, Gentlemen, yours, &c.,
W. S. A.

13th Oct., 1858.

P.S.—Since closing my letter, I am informed that Mr. E. Slack obtained a patent, sealed 25th May, 1858, for "improvements in the treatment and use of wheat and other grains, and amylaceous vegetable substances." I do not know if he, too, seeks to monopolise the acids I have named, and alkalies, and can maintain it, but, if he can, it is the greatest injustice ever perpetrated. I wrote to Mr. Woodcroft, the talented and worthy superintendent of patents, but too late, for, after a patent is granted, he says, "the Commissioners of Patents have no power in the matter; the law gives none to them in such cases;" but he adds, "When a patent is granted for what belongs to the public, it is an injustice on the community, and should be exposed. I quite agree with you in these views. If you were to write a letter to the editor of one of the scientific journals on the subject, the end you have in view would be accomplished. Such a letter as you have written to me would answer the purpose completely."—W. S. A.

DIRCKS'S OPTICAL APPARATUS.

GENTLEMEN,—It was with some surprise that I read Mr. Dircks's paper delivered before the British Association, inasmuch as the experiment brought forward has nothing whatever original about it.

It certainly shows what spectral phenomena are, but throws no light upon their cause, so that I cannot discover what use he has done by bringing it before such an assembly. It is well known to almost every one, and, besides being given in the most rudimentary treatises on optics, is turned to a practical account in many ways. Many children's toys are on this principle, to say nothing of the innumerable tricks of jugglers and other popular "professors" dependent upon it.

I am, Gentlemen, yours, &c.,
J. ALEX. DAVIES.

October 13, 1858.

SOLID INK.

M. LEONARDHI, of Dresden, has invented an ink which he calls "Alizarine Ink," which he can form into cakes for convenience of transport. Liquid inks, hitherto formed into cakes by drying and evaporating, cannot be brought back to the liquid state again satisfactorily. The inventor takes forty-two parts of Aleppo galls and three parts of Dutch madder, and infuses them in a sufficient quantity of hot water. The solution is then filtered, and five and a-half parts of sulphate of iron are dissolved in it, after which two parts of acetate of iron, and one and one-fifth part of liquid sulphate of indigo are added. The whole is then evaporated to dryness, and the residuum is moulded into cakes.

One part of this dry ink dissolved in six parts of hot water gives, says the inventor, an ink of first-rate quality, but one of good quality may be obtained by employing ten or fifteen parts of water to one of solid ink.—*Journal of the Society of Arts.*

PLATT'S PLOUGHING AND TILLING APPARATUS.

GENTLEMEN,—A few weeks ago you favoured your readers with an illustrated description of the above.

Now, while considering it to be a real, and not—alas! what many a patent is—a mere nominal improvement, I think that the effectual breaking up of the subsoil cannot accrue from its use, although this might be partially accomplished. Seeing, or rather thinking, this, I would propose the use of a skeleton cylinder armed with curved and projecting teeth in place of the screw, which should move longitudinally. The ordinary plough blade should of course be fixed in front of this, which I need not say is a species of revolving harrow; when the apparatus would, I think, be superior to that patented by Mr. Platt.

I remember seeing a device of this sort connected with a model of a steam plough in the Paris Exhibition, and need not remark that it would dispense with the common horse harrow. It is possible that teeth fixed upon the screw might be of some use, inasmuch as they would at all events pulverize the ridges already cut, if sufficiently close.

I am, Gentlemen, yours, &c.,
J. ALEX. DAVIES.

October 13, 1858.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

GERMAIN, C. C. C. DE ST. *Improvements in the manufacture of starch.* Dated Mar. 6, 1858. (No. 452.)

This consists in using acetic acid for separating gluten from the starch, and in washing the starch in a solution of chloride of lime, soda, or potash, &c.

BURKE, E. *An improvement in applying iron tubes to locomotive and other tubular boilers.* (A communication.) Dated Mar. 6, 1858. (No. 455.)

This consists in fixing to the end of each of such tubes, or in lining each of such tubes, at the end which comes to the fire-box or furnace, with a few inches of tubing of brass, or other alloy of copper with zinc, or of copper, to prevent rapid destruction by the heat.

CLARE, J. W. *Improvements in apparatus for stopping or retarding railway engines, carriages, and trains, and communicating signals between parts of a train.* Dated Mar. 6, 1858. (No. 458.)

The patentee claims:—1. Combining and arranging blocks fitted on the axles, brace-bars, band-wheels and band-levers, and chains and tubes (or mechanical equivalents), so that by actuating the tubes the chains may wind thereon, causing the levers to tighten the bands on their wheels, and thus effect the retarding or stopping of engines, carriages, and trains. 2. The arrangement and combination with this retarding apparatus of a ratchet wheel to act by contact with toothed wheels, contrived and operating for communicating signals between parts of a train.

CAP, P. A. *An improved construction of billiard table for drawing-rooms.* Dated Mar. 6, 1858. (No. 460.)

The patentee constructs the billiard table so that it may be taken to pieces and put away in a reasonably small space. It cannot be described without engravings.

JOHNSON, J. H. *Improvements in the production of aluminium and its alloys, and in the production of other metals the oxides of which are not reducible by charcoal.* (A communication.) Dated Mar. 6, 1858. (No. 461.)

This consists in preparing aluminium from the sulphuret of that metal, by heating it with anhydrous sulphate of alumina, or with anhydrous alumina, in a non-oxidizing atmosphere; and in preparing aluminium by passing a dry current of hydrogen through or into the sulphuret heated to redness, whilst air is excluded.

MOREL, E. *Improved machinery for drawing fibrous substances.* (A communication.) Dated Mar. 6, 1858. (No. 463.)

This relates to a mode of distributing the pressure put upon the upper and lower pressing rollers of

spinning frames. It cannot be described without engravings.

MAISSIAT, J. H. M. *Improvements in dibbling machinery for depositing grain and manure.* Dated Mar. 6, 1858. (No. 464.)

The special mechanism of this apparatus is as follows:—1. A principal roller, which consists of a heavy cast-iron roller having as many separate discs or wheels as it is required to sow lines of seed simultaneously. 2. A distributing cylinder of the seed, rotating simultaneously with the principal roller. 3. A distributing cylinder of manure in a pulverised state. 4. A reservoir of liquid manure, which is distributed in lines in regulated proportions, with a constant flow on the principle of Marriotte's flask. 5. Cast-iron ploughshares with a double twin fallow, and turning on axes, and disposed between the lines of sowing. 6. The machine is completed by a second or pressing roller, consisting of a wood cylinder with an undulating surface according to the form of ridge it is required to produce.

STONEY, B. B. *Improvements in buoys, floating beacons, and other similar floating bodies.* Dated Mar. 8, 1858. (No. 466.)

This consists in the application of circular or other keels to buoys, beacons, &c., whereby their oscillating motion under the influence of waves is wholly or partially obviated.

LYNE, T. *An improved harrow.* Dated Mar. 8, 1858. (No. 467.)

This invention was described and illustrated at p. 290, of No. 1833.

JOHNSON, J. H. *Improvements in the decoration or ornamentation of leather cloth and similar fabrics, and the application of the same to various useful purposes.* (A communication.) Dated Mar. 8, 1858. (No. 468.)

The essential feature here is the rendering of ornamental designs on leather cloths permanent, by the successive operations of varnishing and calendering, or pressing between rollers.

DOULTON, H. *Improvements in the manufacture of smoke and air flues.* Dated Mar. 8, 1858. (No. 470.)

The parts of flues or blocks are manufactured by expressing clay, &c., through dies. Through each block there is a passage for forming part of a smoke flue, and another to produce an air flue following the line of the smoke flue. The air passages are rectangular on both sides, and by preference curved in the fourth, where it comes next the smoke flue. Three of the exteriors of the surfaces of each block are formed flat and at right angles to each other, and the fourth side is produced partly by a straight line and partly by curved lines, where it connects with the two sides.

BUDD, J. P. *Improvements in the smelting or refining of tin, tin ores, and tin scruff.* Dated Mar. 8, 1858. (No. 471.)

This consists in smelting and refining tin ores and tin scruff in close vessels heated externally, from which the air is excluded, and into which carbon is introduced. The fine tin first separates, and afterwards a higher temperature may be applied to smelt the earthy substances and more refractory metals. The invention is also applicable to the separation of tin from tin plates and shearing.

CLARK, W. *Improvements in gas meters.* (A communication.) Dated Mar. 8, 1858. (No. 472.)

The object here is to indicate several arrangements whereby the hydrostatic tube may be employed in gas meters. The invention cannot be described without engravings.

POYNTER, J. E. *An improved illuminating oil.* Dated Mar. 9, 1858. (No. 474.)

The patentee prepares this oil by mixing fused oil with naphtha, or paraffine oil, or pitch oil, or photogene, or with any oil or oils obtained by the distillation of coal, bituminous shale, bitumen, asphalte, petroleum, or other bituminous substance.

HARRINGTON, G. F. *Improvements in the manufacture of artificial teeth, and in the beds and palates for teeth.* Dated Mar. 9, 1858. (No. 477.)

The teeth used by the patentee are flat, but, instead of the mineral forming the base of the back of the tooth being a part of a circle down to the outer edge of the tooth, it is formed with an angular notch, which, fitting into a metal base, prevents its slipping off, and takes the whole of the force exerted on the point of the tooth towards its base, so that it is only necessary to have one metal pin or blade made in the tooth. The invention also consists of a mode of forming moulds for casting the beds and palates for artificial teeth in any suitable metal; and also in casting the beds of palates in aluminium.

WARLICH, F. C. *Improvements in apparatus for generating steam.* Dated Mar. 9, 1858. (No. 478.)

The patentee causes water to circulate in a coil of pipes heated directly by a furnace above the boiling point. The ends of the coil enter a cylindrical vessel of wrought iron, the pipe so entering being perforated with five holes. The water is then forced through the coil and the perforations in a fine shower of mist, and as it escapes it flashes into steam in the cylindrical vessel which, is heated.

DAVIES, G. *An improved eye or ring bolt.* (A communication.) Dated Mar. 10, 1858. (No. 481.)

The head of this bolt is formed of two jaws and a tongue. The tongue works at one end upon a pin in one of the jaws, and the other end thereof is a tenon to fit the mortice in a holdfast. This holdfast is forked at its lower end to work upon a pin in the body of the bolt, and is morticed at its upper end to fit upon the tenoned end of the tongue. There is a pair of knuckle-jointed levers by the closing in of which the holdfast is moved upon the tenoned end of the tongue, to retain the latter in its position, and by the opening of which the holdfast is withdrawn to allow the tongue to be thrown up, and the line so to be released. The lower end of the bolt is screw-threaded as usual.

DAUPHIN, H. *A new or improved machine for giving to metallic bands a circular or partly circular form.* Dated Mar. 10, 1858. (No. 482.)

This consists in constructing a machine with two rollers, the upper placed at an angle to the other by wedges and set screws, and in the use of guides for giving the bands of iron, &c., a circular and conical form, thus superseding the process of hammering for the manufacture of hoops for casks, barrels, &c.

HARDING, W. *Improvements in breech-loading fire-arms.* Dated Mar. 10, 1858. (No. 484.)

Here the detonating compound by which the gun is discharged is not contained within the cartridge, the gun being fired by the copper cap, as in any ordinary gun. The patentee makes the barrels turn upon a pin which forms part of the female plug or breech, almost parallel with the upper surface of the rib, which pin is inserted in the false breech just below its surface, so that on the barrels being turned upwards to the right or left the breech end is exposed to receive the cartridge. To secure the barrels after the insertion he makes use of the guard as a lever. Attached to the guard is a spindle which works in the false breech. On the underneath ridge attached to the spindle is a hook which catches upon a projection upon the under side of the female plug, so that, on the guard being turned from left to right at right angles with the gun, the barrels are in a position to be turned for being loaded, and on the return of the guard the barrels are fastened. For further security he makes use of a bolt under each barrel, moved backwards and forwards by an eccentric attached to the spindle aforesaid, which prevents the barrels moving on either side on the fall of the cock or hammer. The breeches are bored through same size as the barrels, and to prevent escape of gas he uses a leaden shoe or thimble on the base of the cartridge.

ANDREWS, G. S. *Improvements in washing machines.* Dated Mar. 10, 1858. (No. 485.)

These consist of a machine which plunges in the vessel containing the water and clothes, and has a constant tendency to rise imparted to it by springs to which the plunger is attached.

DAVIES, G. *Improvements in life-boats.* (A communication.) Dated Mar. 11. 1858. (No. 487.)

The hull is here either of wood or metal, the deck at the stem and stern being elevated considerably above amidships; the deck encloses the hold perfectly tight when the hatches and ventilator are closed. A bulk head divides the hold into two compartments, and has an aperture forming a means of communication between the fore and after hold. There is an air chamber at the stem and stern. One of the hatches when opened falls down upon a hinge, and acts as a valve, to prevent the water which may enter the fore hold from passing into the after hold. The boat is propelled by a screw or wheel, driven manually by bevel gearing, cranks, and levers. Raised above the deck is a "look-out."

ROBERTS, R. *Improvements in mechanism for engraving, and otherwise copying in line, paintings and other designs on flat and curved surfaces of metal, paper, and other materials.* Dated Mar. 11, 1858. (No. 488.)

This cannot be described without engravings.

YOUNG, J. *Improvements in lamps.* Dated Mar. 11, 1858. (No. 489.)

This relates chiefly to lamps in which oil is burnt (such as paraffine) requiring a current of air playing directly on the flame for the full development of its light, and consists in making the case or body of the lamp act as a chimney.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

JOHNSON, J. H. *Improvements in the manufacture of stockings and other hosiery goods.* (A communication.) Dated Mar. 9, 1858. (No. 479.)

This relates to making stockings, &c., on the circular loom. In the production of seamless stockings with a calf woven therein it is proposed to employ two circular looms of different diameters, the larger one for the mouth of the stocking and the smaller one for the leg. The mouth is continued down to the commencement of the leg, the dimensions being regulated in the ordinary manner. The mouth is turned back over the second loom, on which the leg is knitted, either down to the commencement of the foot, or so as to include the entire length of the foot. The calf is formed by cutting away the excess of width woven on the first loom after the stocking has been transferred to the second loom. It also relates to a peculiar ornamental imitation seam in stockings, &c.

PEPPE, G. T., and L. GOODMAN. *Improvements in the construction and arrangement of timekeepers.* Dated Mar. 9, 1858. (No. 480.)

This relates to a previous patent of the patentee for an apparatus by which equal portions of time are indicated by the descent or motion of a column of mercury enclosed in a glass tube, and regulated by the passage of air through a small orifice or porous stopper.

BEALE, B. *An improved method of cutting and shaping spokes.* Dated Mar. 10, 1858. (No. 483.)

This consists in mounting spokes eccentrically, and in causing them to revolve against fixed cutters, or in causing cutters to revolve round them. The inventor cuts the tenons at the nave end of the spokes, and completes the shaping of the spokes by setting a number of them upon a revolving frame at a proper angle, and running tools round them, or causing them to revolve against fixed tools.

GEE, G. F. *Improvements in the joining of earthenware pipes for drains, sewers, and telegram wire conductors, also suitable for the conveyance of liquids, gas, and steam under pressure, when jointed.* Dated Mar. 10, 1858. (No. 486.)

This consists in the use of lock semicircular rabitted joints in connecting pipes or tubes, and which joints are protected by semicircular earthenware coverings at each joining. It also comprises pipes which can be used for the conveyance of liquids, or steam under pressure. These pipes have grooves, fillets, rabitted joints, or shoulders, to receive loose or fixed couplings or flanges of wood, earthenware, gutta percha, or metal.

HOLDSWORTH, A. J. *A safety railway oral communication.* Dated Mar. 11, 1858. (No. 490.)

The communicator consists of tubes fixed longitudinally underneath each carriage, coupled to each other by vulcanised india-rubber tubing, joined by screw couplings. Branch tubes are led to the guard, driver, and passengers.

HUMPHREYS, J. D. *Improvements in machinery for moulding, compressing, and solidifying artificial fuel and other substances capable of being compressed.* Dated Mar. 11, 1858. (No. 491.)

This consists in certain machinery whereby substances capable of compression are first received in two tiers of moulds, and subjected to pressure from a press driven by steam, whereby they are compressed into the lower tier of moulds; the upper and lower tiers are then separated, when the material in the lower tier is subjected to hydraulic pressure, after which the substances pass under plungers which drive the compressed materials from the moulds. It also consists in expediting and regulating the return of the ram in hydraulic pipes employed in moulding and compressing by connecting thereto a crank lever or other apparatus to which motion is communicated from any prime mover.

LEATHART, J. D. *Improvements in furnaces.* Dated Mar. 11, 1858. (No. 494.)

Here there is applied to the back end of a furnace in front of the bridge, and below the arch, a small frame of fire bars the width of the furnace, and arranged so as to be readily raised with incandescent fuel thereon, and allowed to remain up till the larger evolution of smoke has ceased. Air is admitted at the sides through slits in the brickwork of the furnace, in front of the small grating, and near the end of the main fire bars.

PORECKY, A. *Improvements in the manufacture of the frames of umbrellas and parasols.* Dated Mar. 12, 1858. (No. 496.)

The inventor makes the ribs of umbrellas, &c., out of thin strips of whalebone, &c., of about 1-32nd or 1-24th in. in thickness, and from ¼ to ⅜ in. in width, which he bends into round or elliptical tubes, leaving the concave part unfilled, like a swan or goose quill, or filling it with a light matter like a porcupine quill, according to the strength required. He also makes the ribs stronger towards the top part, than at the lower part, by making it from the top downwards taper like a straw.

ASH, A. *An improved pocket or other like safety clasp or protector.* Dated Mar. 12, 1858. (No. 503.)

Four flat strips of metal are hinged to form an oblong square frame with vertical sides, which, when pressed together, will present a short strip against a long strip of the frame on either side. A spring causes the frame to open. At one end of the frame when compressed there is a hole near the hinge, through which a notched hook passes, as well as through an opening in the opposite strip to a short spring to which it is fastened. When the frame is compressed, the two sides are clasped together by the spring, but are released by pressing the hook.

WRIGHT, J. *Improvements in the treatment of machine-made malleable iron nails.* (A communication.) Dated Mar. 12, 1858. (No. 504.)

The inventor proposes immediately after the nail is formed by the machine to point them by the hand, or by another machine, and then to anneal them, by placing them on a plate or oven, raised to a high temperature, and then gradually cooled; or by causing it to traverse from a highly heated part to a cooler.

WRIGHT, J. *Improvements in the mode of treating*

tanned and untanned hides and leather. (A communication.) Dated Mar. 12, 1858. (No. 505.)

In treating untanned hides the inventor first subjects them to the action of some substance which will dissolve the glutinous matter within the pores, then to the action of a powerful exhauster, to distend the pores, then introduces the tanning matter, and subjects the whole to powerful compression in a pump. To increase the imbibing surface he presses the hide between rollers, or under a roller studded with small prickers, similar to the barrel of an organ. He also treats tanned hides and leather by pressing them under rollers as described, moistens them so as to distend the punctures so made, subjects them to the action of the exhauster, and forces in, by pressure, liquid india rubber or gutta percha, or a compound of both, or any other gummy or resinous matter insoluble in water, to render them waterproof.

Carter, G. *Improvements in steam engines and machinery for propelling vessels and other bodies in water, and other purposes.* Dated March 13, 1858. (No. 509.)

This consists in improvements in machinery to force air or water, or air mixed with water, or to exhaust air or to force water through pipes, &c. They cannot be described without engravings.

Tilliere, C. *Certain improvements in machinery for forging, planing, and stamping cold or heated metals.* Dated Mar. 13, 1858. (No. 510.)

A vertical standard is fixed to a bed plate, and formed with a guide in which a slide works up and down. To this slide is fixed a cutting tool or hammer, which is raised by a cam on a shaft. To the shaft is keyed a fly wheel, and fast and loose pulleys. The hammer or tool is made to descend by a spring.

Riddle, W. *Improvements in the manufacture of wrought-iron nails.* Dated Mar. 13, 1858. (No. 515.)

This consists in forging wrought-iron nails in dies for making the sides concave and the angles jagged or barbed.

Briet, J. D. *Improvements in pipes for smoking.* Dated Mar. 15, 1858. (No. 519.)

This consists in the application to pipes of an inner bowl, in which the tobacco is placed. A small aperture at the bottom communicates with the outer bowl and leads to the pipe stem, being in the side of the outer bowl, and some distance above the aperture in the inner bowl, so that no injurious deposit can be drawn into the mouth, the outer bowl retaining the essential oil.

PROVISIONAL PROTECTIONS.

Dated September 6, 1858.

2014. J. Fielden, of Woodshade, near Todmorden, medicine manufacturer. An improvement or improvements in the construction or building of cops, whether of cotton, flax, silk, wool, or other fibrous materials, and also for certain utensils thereunto conducing or belonging.

Dated September 9, 1858.

2042. W. Taylor and P. A. Baugh, of Nursling, Hants, gentlemen. An improved apparatus for propelling ships or other navigable vessels through water.

Dated September 17, 1858.

2100. G. Prax, of Paris, manufacturer. Improvements in apparatus for separating the liquid from the solid portions of fecal matters.

Dated September 18, 1858.

2106. J. Luis, of Welbeck-st. A new manner for applying centrifugal force in the manufacture of the fecula of potatoes, of starch, of yeast, of porcelain paste, of paper pulp, and ultramarine, and the apparatus for carrying out the same. A communication.

2108. J. B. Beasley, of Cashel, Tipperary. Improvements in the construction of sporting and all other guns.

2110. H. W. Grylls, of Mark-lane, custom-house agent. Improvements in apparatus employed in submerging or laying down electric telegraph cables.

Dated September 20, 1858.

2114. H. Firmin, of Wapping, carman. A machine for cleansing chaff and other food for horses and cattle.

Dated September 21, 1858.

2116. G. M. Levi, of Maida-vale, civil engineer. Improvements in the manufacture of iron in the blast furnace. A communication.

2118. G. Dowler, of Birmingham, manufacturer, and T. T. Chellingworth, of West Bromwich, civil engineer. An adjustable torsion spring for doors or other purposes.

2120. J. C. E. Malvezin, of Paris, gentleman. Improvements in the manufacture of tubes, pipes, or mains, for conducting liquids or gas, or for other similar purposes.

2122. A. V. Newton, of Chancery-lane. An improved machine for sweeping carpets and floors. A communication.

2124. A. M. Perkins, of Francis-st., Gray's-inn-road. Improvements in surface condensers.

Dated September 22, 1858.

2126. T. B. Hubbell, of Regent-st., gentleman. An improvement in hooped petticoats. A communication.

2130. R. A. Brooman, of 166, Fleet-st., London, patent agent. Improvements in apparatus for printing shawls and other articles. A communication from J. M. Firnstahl, of Vienna.

2134. J. Spence, of Liverpool, iron merchant. Improvements in the manufacture of steel, and in the furnaces employed in such manufacture.

Dated September 23, 1858.

2136. Earl of Dundonald, admiral of the red, of South Kensington. An improved machine or apparatus for tilling and preparing land for cultivation.

2138. H. McGrady, of Bridge-st., Blackfriars, engineer. Improvements in the construction of flues, boiler and other furnaces, and in certain appliances thereto.

2140. D. Grant, of Ludgate-hill, printer. Improvements in colour-printing presses.

Dated September 24, 1858.

2142. P. Pickering, of Danzig, Prussia, proprietor. An atmospheric engine.

2143. R. and W. Ford, gas engineers, of Perth. Smoke consuming by means of a reciprocating or reversing fire.

2145. R. A. Brooman, of 166, Fleet-st., London, editor of the *Mechanics' Magazine* and patent agent. Improvements in the manufacture of pile and cut pile fabrics, and in machinery employed therein. A communication from A. J. Harges.

2146. H. H. and W. F. Henson, of Parliament-st., Westminster. Improvements in waterproofing leather, woven fabrics, fibrous and other materials, and also for rendering them fire-proof, or partially fire-proof.

2147. R. Bodmer, of Thavies-inn. An improved apparatus for preventing explosion in steam boilers. A communication.

2148. C. F. Vassérot, of Essex-st., Strand. Improvements in the construction of spinning cards. A communication from Esnouf and Gouverneur.

2149. W. Richards, of Birmingham, gun maker. Improvements in fire-arms and cartridges.

2150. G. L. Fuller, of Lombard-st., civil engineer. Improvements in steam engines.

2151. G. L. Turney, of Aldermanbury, needle maker. An improved mode of packing pins for sale.

Dated September 25, 1858.

2153. R. Romaine, of Chapel-st., Bedford-row, gentleman. Improvements in the construction of steam cultivators, and in the means for operating such and other locomotive steam engines.

2155. E. Farncomb, of Lambeth. Improvements in Lilliputian fire-arms.

2157. W. Clark, of Chancery-lane. Improvements in purifying natural phosphates of lime. A communication from E. C. Martin, of Paris.

Dated September 27, 1858.

2159. S. H. Greaves, of Sheffield, manufacturer. Improvements in the mode of manufacturing the blades of table and other knives.

2161. W. Lander, of Bristol, engraver. Improvements in engraving and printing for the purpose of ornamenting china and earthenware.

2163. W. E. Newton, of Chancery-lane. Improvements in cigar holders or mouth pieces for cigars, and in pipes for smoking tobacco. A communication from J. W. Evans, of New York.

Dated September 28, 1858.

2165. B. Jones, ironfounder, of York. Improvements in press wheel rollers or clod crushers, which improvements are also applicable to rollers for crushing, bruising, and pulverizing roots and other substances.

2167. G. Mead, of Bethnal-green, ironmonger. Improvements in the construction of tobacco pipes.

Dated September 29, 1858.

2169. J. Manning, of Cambridge, engineer, and T. Paul, of Houghton, miller. An improved stone staff to be used in dressing millstones.

2171. G. Old, of Aston, near Birmingham, warehouseman, and T. Pendleton, of Birmingham, manufacturer. Improvements in dress-fastenings, and in attaching dress-fastenings to articles of dress.

Dated September 30, 1858.

2173. T. Britt, of Church-st., Old Kent-road, engineer. An improvement in the propelling of steam-boats.

2175. J. Morrison, of Birmingham, machinist. An improvement in, or addition to, sewing machines.

2177. L. Cecconi, of Great Newport-st., band master. Improvements in the construction of cornets, trumpets, horns, and other wind instruments of a like nature.

2179. R. Levy, of Manchester, clothier. Improvements in the manufacture of coats, ladies' riding habits, and other similar garments.

2181. A. Normand, of Havre, France, shipbuilder. Improvements in constructing ships and vessels propelled by screw or such like propellers.

2183. J. J. Russell, of Wednesbury, iron tube maker. Improvements in furnaces for heating iron and steel, suitable for the manufacture of welded tubes and other articles.

PATENTS APPLIED FOR WITH COMPLETE SPECIFICATIONS.

2249. C. E. Bull, of Wells, Norfolk, gentleman. An apparatus for containing and preserving articles of value from loss or damage in cases of shipwreck. Dated 9th Oct., 1858.

2265. A. Von Schuttenbach, of St. Petersburgh. Improvements in lamps. Dated 11th Oct., 1858.

2277. M. Sautter, of Paris. Improvements in air engines. A communication from J. Gill. Dated 12th Oct., 1858.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," October* 19*th*, 1858.)

1271. A. Manbré. "Preparing malt," &c.
1275. G. Hadfield, "Protecting vessels."
1278. J. J. Rowley. "Applying lime, soot, &c., to crops, and manure to land."
1301. E. C. Grimshaw. "Furnaces and boilers."
1304. J. Easterbrook. "Ratchet braces."
1306. P. Dumont. "Distributing powder."
1307. H. Rollinson. "Fuel."
1308. T. Robinson and H. Ogden. "Safety lamps."
1319. J. S. Crosland. "Steam engines."
1322. H. Reynolds. "Glycerine."
1325. J. Gemmell. "Starch."
1341. J. H. Young. "Setting up types."
1343. H. N. S. Shrapnel. "Preparing metals."
1347. J. C. Henderson. "Stoves."
1349. L. C. S. Masson and F. de la Morinière. "Woven fabrics."
1355. H. S. Warner. "Charcoal."
1361. C. W. Lancaster. "Charging cartridges."
1367. G. Davies. "Slide valve." A communication.
1373. A. Dawson. "Fuel."
1400. W. E. Newton. "Paper; textile fabrics." A communication.
1424. J. Bates, J. York, and W. Parkin. "Pistons and plungers."
1500. J. G. Jennings and T. Culpin. "Measuring fluids," &c.
1502. J. G. Jennings. "Bricks."
1504. J. G. Jennings and J. Lovegrove. "Water closets."
1651. D. W. Warder. "Beams, girders," &c.
2002. R. A. Brooman. "Supporting skirts." A communication.
2080. W. Riley. "Looms."
2134. J. Spence. "Steel."
2145. R. A. Brooman. "Pile fabrics." A communication.
2149. W. Richards. "Fire-arms and cartridges."
2153. R. Romaine. "Steam cultivators."
2177. L. Cecconi. "Wind instruments."
2183. J. J. Russell. "Furnaces."
2265. A. Von Schuttenbach. "Lamps."

The full Titles of the Patents in the above List can be ascertained by referring back to their numbers in the Lists of Provisional Protections previously published.

Opposition can be entered to the granting of a Patent to any of the parties in the above List who have given notice of their intention to proceed, within twenty-one days from the date of the Gazette in which the notice appears, by leaving at the Commissioners' office particulars in writing of he objection to the application.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

2296. G. T. Bousfield.
2298. G. T. Bousfield.
2302. T. W. Dodds.
2311. E. Wilkinson.
2317. H. Bessemer.
2319. H. Bessemer.
2321. H. Bessemer.
2325. H. Bessemer.
2327. H. Bessemer.
2331. J. Adcock.
2336. S. Statham.
2337. D. Graham.
2344. W. Smith.
2345. W. Basford.
2359. A. Parkes.

LIST OF SEALED PATENTS.

Sealed October 15th, 1858.

708. J. H. Johnson.
818. J. Meyers.
820. W. E. Newton.
848. J. G. Jennings.
851. W. H. Ridgway.
854. H. Edwards.
873. M. Ross.
942. M. A. F. Mennons.
944. E. Tomlinson.
961. J. Chadwick, A. Elliott, and W. Robertson.
973. A. Smith.
1020. J. Castle.
1038. R. B. Goldsworthy.
1118. W. E. Newton.
1166. C. F. D. Monnin.
1202. M. A. F. Mennons.
1320. W. Davis.
1659. L. J. Marks.
1764. A. V. Newton.
1971. M. A. F. Mennons.

Sealed October 19th, 1858.

876. J. Horsey.
877. E. Green and E. Green, jun.
879. B. Parker.
880. W. Bishop.
883. J. Chatterton.
884. G. Gilmour.
887. P. Maugey.
890. P. E. Aimont.
892. J. B. Paddon.
894. T. Donkin.
897. C. Atkinson.
898. H. J. Sillem.
899. J. P. Pirsson.
903. C. Lungley.
904. A. S. Stocker.
906. F. Lillywhite and J. Wisden.
914. J. M. Fisher.
916. J. Westerby.
926. E. White.
946. W. Clark.
959. D. Auld.
969. W. Clark.
987. W. Clark.
1021. R. Openshaw.
1159. W. Harding.
1177. J. Luis.
1329. W. E. Newton.
1454. J. Morgan.
1603. T. Leigh.
1624. T. Greenwood, J. Batley, and J. Salt.
1724. H. Bessemer.
1769. J. J. Russell.
1810. H. Clayton.
1925. J. Biggs.
1977. J. H. Johnson.
1979. W. Rose.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions.

NOTICE TO CORRESPONDENTS.

Articles and Correspondence designed for insertion in the ensuing Numbers of the *Mechanics' Magazine* must reach the Office by the Tuesday of each week, at the latest. It is highly desirable that they should be forwarded earlier if possible.

CONTENTS OF THIS NUMBER.

LONDON: Printed and Published by Richard Archibald Brooman, of 166, Fleet-street, in the City of London. Sold by A. and W. Galignani, Rue Vivienne, Paris; Hodges and Smith, Dublin; W. C. Campbell and Co., Hamburgh.

Mechanics' Magazine.

No. 1838.] SATURDAY, OCTOBER 30, 1858. [PRICE 3D.

Edited by R. A. Brooman and E. J. Reed, 166, Fleet-street, London, E.C.

CARRETT AND MARSHALL'S IMPROVED STEAM PUMPS AND WATER LIFTS.

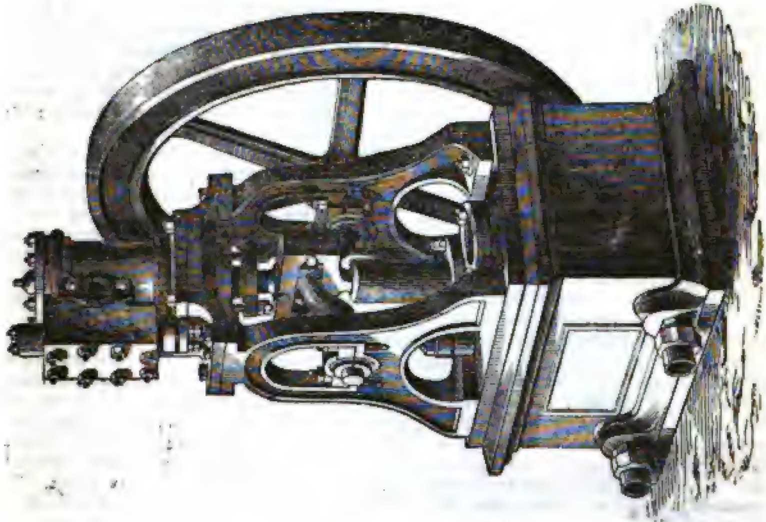


Fig. 1.

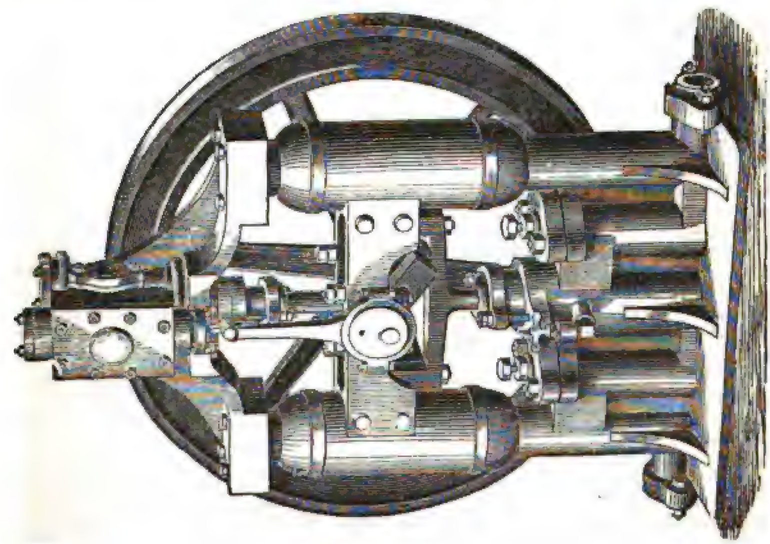


Fig. 2.

CARRETT AND MARSHALL'S IMPROVED STEAM PUMPS AND WATER LIFTS.

BY W. E. CARRETT, ESQ., ENGINEER.*

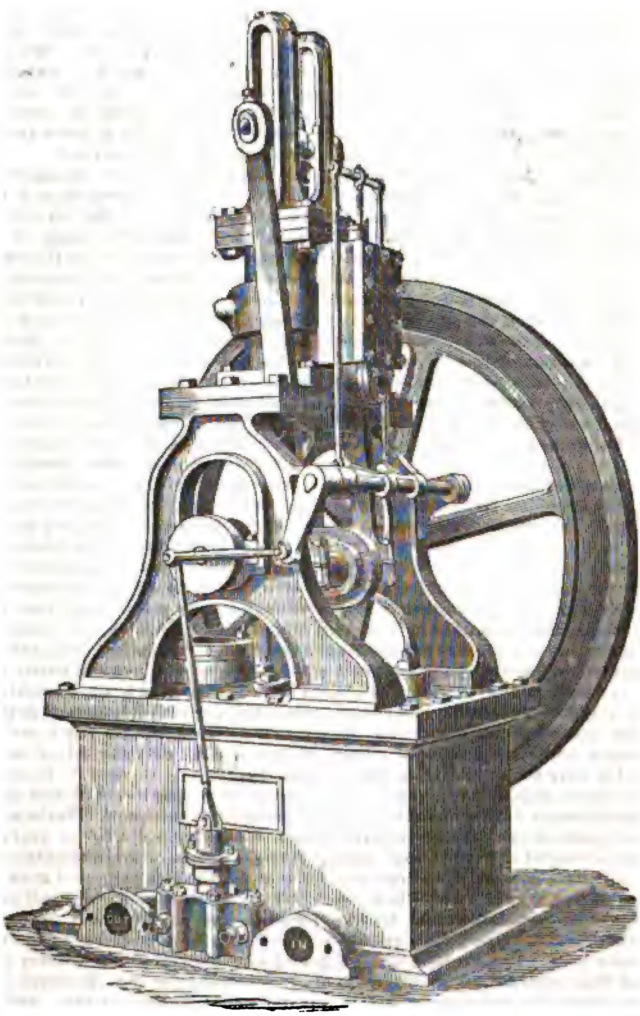
MECHANICAL science and the times are rapidly progressing, as certainly as cause and effect. Next, perhaps, to the greatest of modern inventions, the steam engine, must rank the pump, in its various useful phases of quiet under-working, helping human progress in its countless manifestations, and bringing to light hidden sources of power. Our lands want draining, their crops invigorating, and our coal-fields keeping dry, for water *will* gravitate, and we must keep pumping. If steam is to occupy the place of human power, this water must be forced into our boilers; and, if comfort and health are to be in our dwellings, it must be forced there too. From the great water-works at Haarlem down to the common domestic pump, there is a variety of appliances. We have suctional and force pumps, centrifugal and Archimedean, spray pumps, percussion pumps, wheel pumps, chain pumps, rotatory, vibratory, and others; but the two varieties here claiming a share of attention combine both *steam engine* and *pump* in direct action—power and work associated agreeably, hand in hand, to administer to our wants, perform the drudgery of life's necessities, and leave us more time to think and act.

Our subject of illustration consists of but two combinations of the steam engine and pump. In each case the steam cylinder is directly over, and in immediate communication with, the pump beneath. A comparatively slight transposition of detail would arrange these horizontally if required. The first, fig. 1, is a steam pump of the high-pressure transportable class, having a fly-wheel and connecting rods to the crank shaft; fig. 2 is a modification of this for especial cases where lightness and portability are requisite; and fig. 3 is a compound high and low pressure condensing steam engine, also in direct communication with its pump, and of much larger proportions, used as a water lift. To the two former we would first direct attention. The object here in view is simplicity and durability of parts, a quiet and noiseless action, and, as far as possible, a superior duty effected with a minimum expenditure of power. The chief feature to be observed is, the application of the suctional and compressive air vessels in close proximity to the pumps, by which it is able to fetch the water from any distance (of course within the limits determined by the friction in pipes), or from a depth not exceeding 29 feet; and to force it any required height or distance. The ordinary simple pump cannot do this unless at a miserably slow speed, so as to give the water sufficient time to be stopped and started throughout the entire range of the pipes at each alternate stroke. Three common pumps driven by a three-throw crank will do it at a cost, but not without complication of parts, and sacrifice of all direct-action simplicity. The resistance of the water's inertia against being rapidly started into motion, and the impelling influence of its momentum when in motion, have caused countless failures and disappointments in pumping schemes. To get an ample supply of water quietly and freely into and out of the pump is not always as easy as it is desirable. Since, therefore, the water in a long range of suctional and delivery pipes will not be stopped and started into motion in immediate accordance with the demands of a single-acting pump, but will testify its natural objection to be hurried by a series of shocks and strains which soon impair the best machinery and clacks that can be applied; since, further, a double-action pump is little or no better, unless we are disposed to sacrifice direct action and apply three pumps, or to be content with one large one driven at slow speed, we must adopt more simple and effective expedient, which, in the writer's judgment, consists in those air-vessel appliances which enable the pump to work quietly at a speed of 110 feet per minute. A continuous stream in the pipes is, therefore, essentially necessary. Perhaps one practical case in point may show this clearly enough for our object. Some years since the writer had to inspect a pair of single-acting plunger pumps of considerable size (driven opposite and simultaneous), constructed to force about 150 feet high, and draw the water say 30 feet distance, and from 15 feet depth. They would not pump at all except at a very slow speed, quite insufficient for the purpose; and a few strokes beyond this the shocks and percussions in pumps and pipes threatened total destruction, to say nothing of the power lost. An air vessel was suggested and applied to the delivery side of the pump, and was expected to put all right, but it only changed the character of the evil. At each up stroke the water could not follow the ram for want of time, and when the down stroke commenced the inlet current was about at full speed, and actually accumulated to some 5 lbs. to 7 lbs. per square inch in the suction pipes. Another air vessel close to the inlet of the pump at once settled all difficulties, and the action became at once noiseless and effective, even at a fourfold speed. So simple was the remedy for so great an evil! and yet there are hundreds of mal-constructions to be met with everywhere in which the pump and water are thus continually combating with each other. Turning to

* British Association, 1858.

advantageous account this percussive action of the inertia and momentum of water, we have Smeeton's simple contrivance (whose birthplace and remains are but a few miles from this town), the hydraulic ram, in which the gravitating power of a body of water forces a portion of itself to a greater height; and we might further exemplify it in the shape of a "percussive action suction pump," which would raise the water by the joint impetus of its momentum and the pressure of the atmosphere, from a greater than the usual depth of 30 feet. In reference to our illustration, fig. 1, a good single-action plunger

Fig. 3.



pump does all that is required. The frame striking the shaft of the fly-wheel transmits the power of the engine to pump. This frame is curved to the arc determined by the length of the connecting rods, and moves up and down with the piston rod, but does not touch the crank shaft passing through it. The purpose of this will be obvious. In fig. 2, the air-vessel arrangement is disposed in two hollow columns supporting the steam cylinder, and is suited for greater pressure where compactness and durability are essential.

(*To be continued.*)

THE PATENT LAWS.

REPORT of the Committee of the British Association, presented to the Mechanical Section, by W. Fairbairn, F.R.S., President:—

The subject of the patent laws has frequently occupied the attention of meetings of the British Association, and committees have been, from time to time, appointed for the purpose of considering how those laws might be rendered more efficient for the objects with which they are maintained. Your vice-president, the Rev. Vernon Harcourt, in the inaugural address at the first meeting of the Association, held at York, September, 1831, in which he expounded the objects and plan of the Association, referred to those laws as an instance in which fiscal regulations interfered with the progress of practical science, and as failing to give protection to property in scientific invention to the same extent as protection is given to every other species of property, and he suggested a revision of those laws as one of the subjects to which a scientific association might be justly expected to call public attention, and your vice-president, Sir David Brewster, and others, have, on several occasions, brought the subject before meetings of the Association.

By the Patent Law Amendment Act, passed in the session of 1852, the rights of the inventor to property in the offspring of his brain, and in the creations of his intellect, when embodied in products of national industry, were fully recognised; provisional protection to that property was secured to such inventor, from the date of his application for a patent; one proceeding was substituted, and one patent issued, extending to the whole of the United Kingdom, instead of three proceedings and three patents, separate and distinct, for each of the three countries, England, Scotland, and Ireland; property was created, and protection obtained for six months by a payment of £5, for three years by a payment of £25, and for the further terms of four and seven years by additional payments of £50 and £100 respectively, instead of by the payment of upwards of £300 in the first instance, under circumstances of such uncertainty as threw discredit on the whole system; the specifications of all patents are to be printed and published, and sold at extremely low prices, a benefit to the public, as well as the inventor, which it would be difficult to estimate too highly; and, lastly, provision was made for the regulation of matters relating to patents, by commissioners furnished with ample powers for the purpose.

This Act came into operation on the 1st of October, 1852, and the experience of the first two years showed that the payments by inventors, upon the above scale of charges, would be at the rate of more than £50,000 per annum, without including the further or additional payments for the maintenance of the patents for the further terms of four or seven years, after the expiration of the first three or seven years respectively. At the meeting of the British Association in Liverpool, September, 1854, a committee, presided over by the Earl of Harrowby, was appointed "for the purpose of taking such steps as may be necessary to render the patent system, and the funds derived from inventors, more efficient and available for the reward of meritorious inventors, and the advancement of practical science." This committee communicated with Earl Granville and Lord Brougham, to whose exertions and watchful care the passage of the measure of 1852 was attributable, and made a report to the meeting of the British Association held in Glasgow in the following year, when the subject of the tax on inventors, and the appropriation of the funds so levied, was fully discussed; and another committee, consisting of his Grace the Duke of Argyll, the Earl of Harrowby, Colonel Sabine, the Master of the Mint (Professor Graham), Mr. Fairbairn, and Mr. Webster, were appointed with similar powers. The Glasgow Committee addressed a memorial to the Lord Chancellor (Lord Cranworth), calling attention to the proceedings which had taken place at the various meetings of the British Association; to the numerous questions of administration and legislation then adverted to, or which might be expected to arise; and suggesting that Her Majesty should be advised, in accordance with the provisions of the Patent Law Amendment Act, 1852, to appoint others than the official commissioners, and to make the working of that Act the subject of immediate inquiry.

At the meeting of the British Association held at Cheltenham in 1856, a committee, consisting of the Earl of Harrowby, Lord Stanley, M.P., Mr. Fairbairn, Professor Graham (the Master of the Mint), Mr. James Heywood, Mr. Commissioner Hill, General Sabine, and Mr. Webster, were appointed with like powers. The Earl of Harrowby and Mr. James Heywood communicated personally with the Lord Chancellor; Lord Stanley took a warm interest in the subject, embodying his views on the necessary alterations in a published pamphlet; but up to this time the objects in view have not been attained, and it will be for this meeting of the British Association to consider what further steps should be taken.

The printing and publication of the specifications have led to results which were hardly anticipated, as to which the following extract from a report of the Commissioners of Patents in 1856 will be read with interest:—

"The Commissioners of Patents have presented complete copies of all their publications to such of the Government offices and seats of learning as have applied for them, and to the principal towns in the United Kingdom, on condition of their being daily open to the inspection of the public free of charge. In their selection of towns for this gift, they have been guided by the number of applications for patents proceeding from each.

"This gift has in most cases laid the foundation of public free libraries where none previously existed. In some instances where the local authorities hesitated to accept the works on account of the incidental expenses, the custody has been solicited and temporarily undertaken by scientific institutions, which have modified their bye-laws to enable a free admission to the public daily to the library in which the works are deposited."

The same report, after enumerating a list of the places which have received the works, says:—"It is satisfactory to find that these national records of invention are especially consulted by that class whose skill in the improvement of manufacture is so essential to the maintenance of the commercial prosperity of this kingdom," and adds the testimony of the librarians of several of the free libraries to the same effect.

Complete sets of the Commissioners' works have been sent to the Colonies, to many foreign States, to the Patent Office, Washington, to the Astor Library, New York, to the Franklin Institution of Pennsylvania, to the Public Free Library, Boston, U.S.; and the Hon. Charles Mason, Commissioner of Patents for the United States, addressing the Commissioners of Patents in this country, writes as follows:—

"The admirable example you have set in publishing the specifications and drawings in full, and putting them on sale at a moderate price, so that all can easily provide themselves with what they need for private use, will ere long, I trust, stimulate our own Government to do the like. Nothing short of this in the way of publication can give permanent satisfaction."

A free library and reading-room has been opened at the Office of the Commissioners of Patents, containing a large collection of works of reference, which, as the same report states, is numerously attended by professional men, the agents of foreign and provincial inventors, and by practical mechanics and operatives; and Mr. Woodcroft has collected a large number of portraits of inventors, and of models illustrative of the history and progress of invention, which it may be hoped at a no distant period will form a principal object in a National Gallery of Inventions and Museum of Inventions.

These and other undertakings, well suited to promote the advance of practical science and the interest of inventors, afford legitimate objects for the expenditure of the surplus funds levied on inventors, but when ample provision shall have been made for these objects there will still be a considerable annual surplus.

The amount paid by patentees during the last year was upwards of £83,000, and, after the commencement of the payment of £100 at the expiration of the seventh year, the amount levied on inventors will not be less than £100,000 per annum, a sum which, as levied on inventors and inventions, may reasonably be expected to be expended on objects in which inventors have some interest.

In reference to this branch of the subject the following questions would appear to arise for consideration:—

1. Should the present scale of payment be maintained or reduced, so as to leave no great surplus beyond what may be necessary for the official expenses?
2. If the present scale be maintained, how should the surplus be appropriated?

It appears that the second payment of £50 before the end of the third year is not made in respect of more than about one-fourth of the whole number of patents issued, that payment being made on about 500 out of 2,000 patents, so that 1,500 are permitted to lapse, the cost of which in money to the patentees cannot be taken at less than £75,000, in addition to the expenditure of time and labour on the respective inventions. Can anything be done to diminish this loss, beyond affording every facility for access to information as to what has been done before, and the improved education of the people?

In addition to these considerations and suggestions in connection with the new system as recently established, and which are of the fiscal character referred to by your vice-president, there are some other questions deeply affecting the interests of inventors, and the advancement of practical science, which it would not be proper to close this report without adverting to.

The Patent Law Reform of 1852 was never regarded as a final measure. It was but a first instalment, obtained under great

difficulty; it only laid the foundation of the superstructure yet to be raised. The following important questions of—1. Improved protection to the property so created; 2. The amendment of existing patents and specifications, so as to save what is really new and useful, according to the amendment of the Patent Law, as effected by Lord Brougham in 1835; 3. The confirmation of an invention re-invented and introduced into successful use according to the principle of the confirmation of rights effected by the same noble lord; 4. The extension of the term of patents which have not yielded adequate remuneration to the inventor; 5. Reward to a meritorious inventor, who, from causes wholly beyond his control, has been a great loser by, or derived no benefit from, a meritorious invention, from which the public have derived great benefit; 6. A system of compulsory licences under existing patents—are questions all of which were omitted advisedly by the promoters of the recent measure, their attention being directed mainly to the destruction of the existing, and the establishment of a new system of creating property in inventions.

These, with other amendments and matters of minor importance, which the experience of six years of the working of the new system have disclosed, will involve further legislation, and the consolidation and repeal of no less than sixteen statutes or parts of statutes, an object of great importance to every inventor.

Your committee now remit this subject to the consideration of the meeting of the British Association, deriving confidence from the belief that the times are not unfavourable for further action, and that the town and neighbourhood in which the Association is now assembled may appropriately claim to take a prominent part in the consummation of those reforms which have occupied the attention of so many meetings of the British Association.

Leeds, Sept. 22, 1858.

OAK PAPERS.

We noticed in No. 1825 the invention of Mr. John Stather, of Hull, for producing oak or "wainscoat" papers, and have lately been favoured with an inspection of some of the papers, which are now being manufactured on a large scale. The grain, being printed, as our readers will recollect, from a piece of the wood itself, is perfectly true to nature, and far surpasses any produced from blocks engraved by hand. From the same piece of wood, the pattern can be varied almost *ad infinitum*, for by simply taking off a shaving a different design appears.

PROFESSOR RANKINE ON PRACTICAL SCIENCE:

BEING THE ADDRESS DELIVERED IN GLASGOW AT THE OPENING MEETING OF THE SECOND SESSION OF THE INSTITUTION OF ENGINEERS IN SCOTLAND, ON THE 27TH OCTOBER, 1858.

BY W. J. MACQUORN RANKINE, C.E., LL.D., F.R.S., PRESIDENT.*

When, a year ago, I had the honour to deliver an introductory address on the nature and objects of our Institution, I ventured to indulge in anticipations of success, founded on the character of engineering industry and skill in this city, and in Scotland generally. I have now to congratulate you on the fact that those anticipations have not only been realized, but exceeded. The time of our meetings has been fully occupied by papers and discussions of great interest and practical value, which have been published in a volume that speaks for itself. The number of our members has greatly increased, and goes on increasing at each successive meeting; and our financial position is perfectly satisfactory.

I shall now address to you some remarks on the present condition of the branches of practical science which we cultivate; on the extent to which, during the past year, they have been advanced, by our own labours and those of others; and on some of the many questions which they still present for solution.

DECIMAL MEASURES.

The subject of decimal measures was brought before us by the papers of Mr. Neilson and Mr. Holland, and discussed at three meetings. With reference to Mr. Neilson's proposal, that the French system of measures should be adopted at once, and as a whole, I may remind you that doubts had been entertained whether so great and sweeping a change could easily be introduced amongst workmen, and that various members mentioned instances of the ready adoption by workmen of French measures, tending to remove that doubt. I am happy to be able now to refer to additional facts of the same character, tending to prove that amongst intelligent artisans (and no others are fit for engineering work) no difficulty whatsoever would be met with in the introduction of the metrical scale. I had recently the satisfaction of visiting the locomotive works of an eminent engineering firm at Leeds—Messrs. Kitson, Thompson, and Hewitson; and there we

* The above address has been slightly abridged. —Eds. M. M.

found several engines in progress for foreign railways, all made to French measures, of which the workmen, with the utmost willingness, had learned the use in a few minutes. It appears that the metrical system is being introduced by degrees into practice, without the aid either of legislation or of the action of societies. There is a close connection between the subject of standards of measure and that of engineering tools. Papers on this branch of mechanics are much to be desired, and would prove interesting and useful.

THE EXPANSIVE USE OF STEAM.

Papers by Mr. Morton and Mr. Lawrie, on the expansive working of steam, and the discussions on them, have tended to elucidate and to establish the principle, that, in order to realize the economy properly due to expansion, means must be taken, by steam-jackets or otherwise, to prevent that condensation which always takes place in saturated steam when it performs work by expansion, without being supplied with heat from an external source. It is not that such condensation constitutes of itself a loss of power, but that the liquid water produced, by its presence in the cylinder, acts as a conductor, diffuser, and equaliser of heat, and tends to cool the steam at the beginning and warm it at the end of the stroke, and thus to lower the initial pressure and injure the vacuum, to reduce the work of the engine below that which is properly due to the expansion, and to make it approximate to that of a full-pressure engine, working at some pressure intermediate between that of the admission and that of the exhaust. By the use of the steam-jacket, the condensation of a certain quantity of steam is not prevented; but, instead of taking place in the cylinder, it is made to take place in the jacket, where the liquid water produced is not injurious.

THE UNIT OF HEAT.

I am happy to recognize evidence that the true principles of the mechanical action of heat, founded on the idea that heat is not a substance, but a form of energy, are making their way amongst practical men, and are being usefully applied by them. As a means of facilitating that progress, by putting the expression of those principles into a shape more familiar to practical engineers than their present form, it was recently suggested by Mr. Stephenson, that, instead of the unit of heat commonly employed in scientific treatises, viz., so much heat as one pound of water requires in order to raise its temperature by one degree, quantities of heat should be expressed in terms of a unit which practical men oftener have occasion to think of, viz., so much heat as one pound of water at 212° of Fahrenheit requires, in order to convert it into steam at the same temperature; or what is commonly called "the latent heat of one pound of steam at 212° of Fahrenheit;" being, in fact, the unit of heat now commonly employed in comparing the effects of different kinds of fuel and different forms of furnace. This suggestion of Mr. Stephenson appears to be well worthy of consideration and discussion. The following is a comparison of different units of quantity of heat, British and French, reduced to their equivalents in units of mechanical energy, as a common standard of comparison, based on the experiments of Joule.

COMPARISON OF UNITS OF HEAT.

BRITISH UNITS.

	Equivalent energy in foot-pounds.
One degree of Fahrenheit's scale in a pound of water	772
One degree of the centigrade scale in a pound of water	1390
Latent heat of one pound of atmospheric steam	745780

FRENCH UNITS.

	Equivalent energy in kilogrammètres.
One degree of the centigrade scale in a kilogramme of water	423·7
Latent heat of one kilogramme of atmospheric steam..................	22730

One kilogrammètre = 7·23314 foot-pounds.
One foot-pound = 0·138253 kilogrammètres.

SUPER-HEATED STEAM.

Besides the proper management of the expansive working of steam, we have another means of improving the economy of power in the cylinder of the steam engine, by using steam heated to a temperature higher than the boiling point, corresponding to its pressure, or, as it is commonly called, "superheated steam." The efficiency of any engine moved by the mechanical action of heat in any fluid is the greater, the greater the difference between the temperature at which the fluid performs its work and that at which it is either rejected or condensed, as the case may be; and the use of superheated steam enables us to work at a high temperature, without producing a dangerous pressure. Although the practical use of superheated steam has made considerable progress of late, there is still a scarcity of data for precise calculation on the subject; the only experiments on the laws of expansion of superheated steam being those of Mr. Siemens, which are of too limited extent.

THE CONSTRUCTION OF STEAM SHIPS.

The instances which practice has lately afforded of improvements in the economical working of steam are so numerous, that it would be impossible, within reasonable limits, to give even a condensed view of them all; and, if I now select one case as an example, it is simply because the economy in that case was ascertained by experiments conducted under my own inspection. It is that of the engines furnished by Messrs. Randolph and Elder to Mr. James R. Napier for the steamer *Admiral*, which he lately built for a Russian company. The engineers guaranteed to the builder that the consumption of coal should not exceed three pounds per indicated horse-power per hour, and the actual consumption, as ascertained by me, was too pounds and nineteen-twentieths. The steamer which I have now mentioned is an example of progress in naval architecture, as regards the precision with which the power required to propel a ship of a given size and shape at a given speed can be computed beforehand; a point of the highest importance both to the purchaser and to the builder. In the present instance, the builder, Mr. James R. Napier, in his contract with the purchasers, bound himself under heavy penalties to fulfil conditions as to draught of water, cargo, speed, power, and consumption of coal, which he could not possibly assure himself of fulfilling, except by being able to compute beforehand the resistance and propelling power of the ship at any required speed, *from the drawing of her lines*, with very great precision; and in this he was perfectly successful. In such calculations as these an error in excess is as fatal as an error in defect; for if, in order to make sure of fulfilling the contract as to speed, the engines are made too powerful, they become also too bulky and heavy, and the conditions as to cargo and consumption of fuel are violated. It is true that by the common method of calculation, that is, by making the indicated horse power proportional to the square of the lineal dimensions multiplied by the cube of the speed, the power required by a proposed new ship may be computed with tolerable exactness, from the results of a previous experiment on an existing ship of similar, or nearly similar, figure and proportions; but if no such experiment has been made or recorded, and especially if the proposed vessel has anything new and unusual in her proportions and shape, that method totally fails. It is to be hoped that a great body of useful experimental data on the subject of the propulsion of ships, whether by steam or by sails, will be collected by the committee appointed for that purpose by the British Association during their meeting at Leeds. It may be regarded as certain, that experiments on the resistance of models are almost worthless for the purpose of determining the propelling power required by ships of figures similar to those of the models. The forces which constitute the principal part of the resistance to the model and to the ship respectively, are of different kinds, and follow different laws: in short, to determine the laws of the resistance of real ships, we require experiments on real ships, and such are the experiments which the committee in question propose to collect and arrange.

PROPULSION ON CANALS.

It is gratifying to observe, that the improvement of propulsion on canals, which the sudden advancement of railways at one time caused to be neglected, is now employing much skill and ingenuity. Mr. Robson and Mr. Milne gave this Institution last session some interesting information as to steam propulsion on the Forth and Clyde Canal, showing a good economic result. Recent experiments on the Aire and Calder navigation (as stated by Mr. Bartholomew to the British Association*), have shown that by the use of steam tugs for the conveyance of minerals, the cost of locomotive power has been reduced to between one-tenth and one-twelfth of a penny per ton per mile—the usual cost of horse-power being one eighth of a penny. It is still much to be desired that a practical trial should be made of Mr. Liddell's mode of propulsion on canals, to which I referred on a former occasion—viz., by means of fixed steam engines and endless wire ropes.

DISCOVERY OF IRONSTONE NEAR GLASGOW.

I am sure that all the members of this Institution will rejoice at the recent opening of a field of ironstone in the outskirts of the city of Glasgow; an event which must contribute not only to the prosperity of this neighbourhood, but to that of the whole country. It is a remark not the less true for being commonplace, that coal and iron are the roots of the material greatness of Britain. At the recent meeting of the British Association, nothing gave greater satisfaction to the multitude assembled than the announcement by Professor Phillips that the lately opened ironstone field of the north-east of Yorkshire is likely to last two thousand years.

(To be continued.)

* Mr. Bartholomew's paper is not very intelligible without engravings, which we hope to be able to supply after the delivery of another paper which Mr. Bartholomew contemplates reading at a Scientific Institution in London.—EDS. M. M.

TESTING SUBMARINE CABLES.

ON SOME OF THE DIFFICULTIES IN TESTING SUBMARINE CABLES.

BY E. O. WILDMAN WHITEHOUSE, ESQ.*

AMONG the many difficulties experienced in the use of long submarine lines of telegraph, the process of testing for a fault constitutes not the least. To ascertain the actual amount of loss of current upon any given length of cable as compared with the whole battery force employed is an easy process; but to determine by any examination made at one end, first, the existence of a fault; secondly, its degree or nature; and, lastly, its position or distance from the operator, may be at times one of the most difficult problems in electro-telegraphic research. The length of the line under examination of course must materially influence the question; for it must be obvious, that anything short of absolute perfection in each mile length, or at each joint, when multiplied by 2,000 or 2,500, would give in the aggregate a most striking and almost startling amount of loss. It is this, perhaps, which introduces one of the most embarrassing features; for you are searching for a fault the evidences of which are surrounded and masked by the aggregate effect of myriads of minute microscopic and unavoidable imperfections, in the material of which the insulating medium consists. This unavoidable loss necessarily enters as a disturbing element into all the results, and its amount varies with the temperature to which the cable is exposed. The occurrence of a slight fault at a considerable distance will hardly make an appreciable difference in the amount of loss, while the same amount of injury close at hand may most readily be mistaken for a serious fault at a distance, to which indeed some of the evidences bear the strongest possible resemblance. It admits, indeed, of demonstration experimentally, that upon a single mile of cable a variable fault, capable of accurate graduation by water resistance, can be made to assume all the features of a serious fault at any required distance—the features, that is, as recognised in the more usual methods of testing by resistance. I would not be supposed to underrate for a moment the real value of this mode of research and examination, but there are conditions when I believe that the indications derived from it may lead to the formation of most erroneous opinions, which might wisely be guided and corrected by an appeal to another standard.

We have supposed a cable of 100 miles in length; test it, and you find its insulation as perfect as may be; now, connect the distant end to earth—test again, and we have "earth," with a resistance equal to 100 miles, taking the mile, if you will, as unity. Change once again, by disconnecting the further end from the earth, and by inserting instead at every mile a very minute fault, say a wetted thread, or very fine resisting wire of less than one-hundredth the conducting power of the cable; anything, in fact, so that the aggregate of their resistances or conductivity, together with the cable itself, equal the resistance in the previous experiment,—you again have "earth," with a resistance equal to 100 miles. It will be found impossible by the use of the mere resistance tests to distinguish between these two conditions of experiment.

It is under such circumstances that appeal may with advantage be made to another mode of testing, less frequently used, and of course known and introduced only since the discovery of gutta percha. I mean the mode of ascertaining the state of insulation, by examining the capabilities of the cable to retain and give back a charge communicated to it,—viewing it, in fact, in its special inductive function. It will be found that the many minute points of defect spread over the line diminish the Leyden-jar effect materially, by affording so many points of escape for the current. The defect at the distant end, on the other hand, allows the whole length of 100 miles to be charged up to a certain degree, and, on disconnecting the home end from the battery, and instantly passing the discharge through any suitable instrument to earth, you receive and may measure the amount thus drawn from one half the length of cable, the remainder having discharged itself through the fault at the other end.

On the occurrence of the accident to the Atlantic cable last year, when nearly 400 miles were lost, I tested my resistance experiments by an appeal to this mode of examination, before I ventured to state my opinion, that the end was either lost, or its insulation entirely destroyed at that distance. The unfortunate casualty to our cable of the present year was examined by me in this way, though necessarily very hastily; sufficient evidence, however, presented itself to satisfy me of the existence of loss upon the cable close at home, at the very time that the resistance experiments had determined its site at 600 miles, distance. The matter was put to the test practically by raising the end of the cable in the harbour, and upon little more than half a mile of it there was found to be more loss than I allowed to pass, if detected by the use of equal battery power, in a hun-

* British Association, 1858.

dred miles, at the gutta-percha works, during the process of its manufacture. On that occasion I expressed the opinion that the fault was but partially removed, and that "there was still more to come out." I have seen no reason to alter that opinion. I need not say more than to commend this subject to the attention of the practical telegraphists connected with submarine telegraphy.

ELECTRIC TELEGRAPH CONDUCTORS.

A Few Thoughts on the Size of Conductors for Submarine Circuits.

BY E. O. WILDMAN WHITEHOUSE.*

I take it as indisputable, that for overground telegraphs the size of the conductor stretched from post to post need be limited only by considerations of convenience and expense; it cannot well, electrically speaking, be too large. In submarine circuits other questions arise. The difficulty of perfectly insulating a conductor is of course increased in proportion to the extent of surface to be covered, while the augmentation of the internal surface of gutta percha increases the dimensions of the Leyden jar to be charged. In circuits of moderate length these are matters of little moment, as the shortest contact practically used in telegraphing fills the wire from end to end with a continuous current, and the special embarrassment arising from induction is inconsiderable and unnoticed. When, however, the length of the cable is much greater, the amount of dynamic electricity assuming the static form, and thus consumed on the way, is much larger; and this loss takes place increasingly along the whole line, so that, if the sectional area of the wire had been fairly proportioned to the amount of current entering, it must, before the wave of force reached the other end, become largely disproportioned thereto. In an ordinary non-inductive conductor, this would give rise to no embarrassment or loss, but when the already enfeebled current has still to continue at every mile charging the surface of an unnecessarily large conductor, it is conceivable,—it is even, I believe, demonstrable,—that an unnecessary waste of power ensues, and increased retardation is observed. I have records of some experiments where such an effect was noticed in a remarkable degree, though allowance must be made for some of the conditions which were anomalous. A cable of given length, containing six insulated wires, afforded the opportunity of making so many variations in the size, and equally in the surface, of the conductor employed; of course, as long as this was made to convey a continuous current, the conducting power of the arrangement was simply proportioned to the sectional area; but when signals at brief intervals were employed with intermissions and reversals, the loss in amount of current received, and the retardation observed, augmented largely with the use of additional conducting wires. These observations arrested my attention most forcibly at the time, and, from having let fall an opinion that I thought it possible that a submarine conductor might be too large for practical use, it has been erroneously supposed and stated that I held the converse opinion. I have not seen the subject fairly worked out by any one under this aspect, and I merely suggest that the induction to which submarine conductors are necessarily subjected removes the question from the sole operation of those simple laws which regulate the usages of other conductors, and introduces a new element into the calculation, the value and force of which I do not find fully recognised. My assistant, Mr. Samuel Phillips, suggested to me at that time the idea of a conductor (working one way only) being tapered so as to accurately represent the sectional area of the current, if I may so express myself, in every stage of its progress,—an idea which is, I think, well worthy of attentive consideration. I have had some lengths of cable made, the sizes of whose conductors, for extreme experiment, are related as one to a hundred. Present leisure from the engrossing details of official duties will, I hope, afford me the opportunity of examining this subject experimentally.

* British Association, 1858.

REA'S IMPROVEMENTS IN IRON SHIPS.

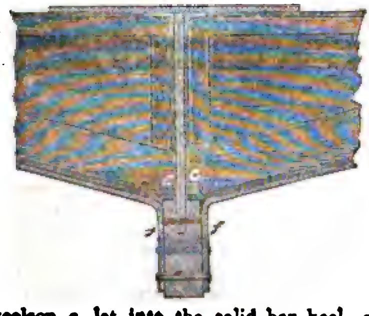
Mr. James Rea, of Blackwall, has introduced several improvements in the construction of the keels, stems, and sternposts of iron ships, and in the junction of the keelson therewith. His invention consists in cutting a groove in the solid bar sufficiently deep to receive a keelson plate of the proper thickness, according to the dimensions of the ship to be built. The keelson plate extends from stem to stern, and to any height up the posts that may be found necessary, and is fitted tight into the groove cut in the keel, the stem, and the stern-post, and then firmly riveted and caulked, thus uniting the whole efficiently, without running any risk of leakage, to which a keel composed of plates, as heretofore, is more or less subject. The plan also

affords means of connecting the ribs or frames to the stem and stern-post. A modification of the plan consists in forming a rabbet or rabbets to produce a rib on the upper edge of the solid keel, stem, and stern-post, and in riveting the keelson plate or plates to the same. This may be extended to any height up the stem and stern-post, which not only increases the strength of the post, but affords the means of properly securing the frames or ribs of of the ship.

Fig. 1.

Fig. 1 of the accompanying engravings represents the stern-post and part of the keel of a screw steamer with the improvements applied; *a* is the keel, and *d*, *d* are the stern-posts, showing the keelson, *c*, secured to the keel, *a*, by inserting it tightly in a groove (indicated by the dotted line), and securely riveting it through. Fig. 2 is a midship section, showing the

Fig. 2.

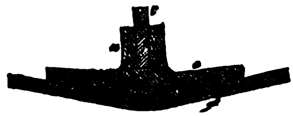


keelson, *e*, let into the solid bar keel, *a*. Fig. 3 is a section of a solid bar for a flush

Fig. 3.

keel, made of a T form, the internal or vertical bar, *a*, of which is grooved, so as to receive the deep keelson. The flange, *e*, *e*, on each side is sufficiently wide to allow of its being connected to the garboard plates, *f*. *f*. This presents the advantage of the solid keel combined with the deep keelson, besides effecting a saving of twelve inches in the draught of water. Fig. 4 is

Fig. 4.



another form of flush solid bar keel, the only difference being, that it has the flanges placed internally instead of externally, and is rabbeted to receive the garboard plates. Mr. Rea's improvements have been patented.

THE IRON TRADE.

(FROM OUR CORRESPONDENT IN STAFFORDSHIRE.)

Present Condition and future Prospects reviewed—Board of Trade Returns for Sept., 1858 and 1857—Ironmasters' Quarterly Meetings—Prices confirmed—By whom and how long these Prices are adhered to—The Practice of fixing Prices growing old—The Trade affected by the Strikes of Colliers—The Strike in South Staffordshire and West Yorkshire.

In the past month the progress of the iron trade has been onward in every district devoted to its manufacture. That the progress has been rapid it cannot, however, be truthfully said. But, although slow, yet it has been sure; and, as Christmas approaches, the aspect of affairs becomes brighter. Commerce and trade will by the spring of 1859 have so far recovered the recent disturbed action to which they have been subjected, that in the usual course of things the iron trade will then be greatly revived; but when to this is added a largely increased demand through its application to certain branches of mechanical engineering and its more extended use in other directions, which by that time will be beginning to spring up, a brisk trade may be confidently looked for; and this notwithstanding that the quantity of iron produced is greatly on the increase, through the opening up of new districts.

The Board of Trade Returns for September show that, as compared with the corresponding month last year, there was in the case of pig iron a diminished exportation to all countries; but in respect of bar and rod iron there was an increase in the shipments to France, while the exports to all other countries were much below those of the corresponding period of last year.

The export trade in cast iron was remarkable for the large quantities sent to India and Australia, the value of the exports to the former country being £41,070, against £6,179, and of those to our southern colonies £20,946, against £11,274. The exports of wrought iron to India rose from £25,211 to £34,083. The American trade improved in respect of pig iron: the figures are—

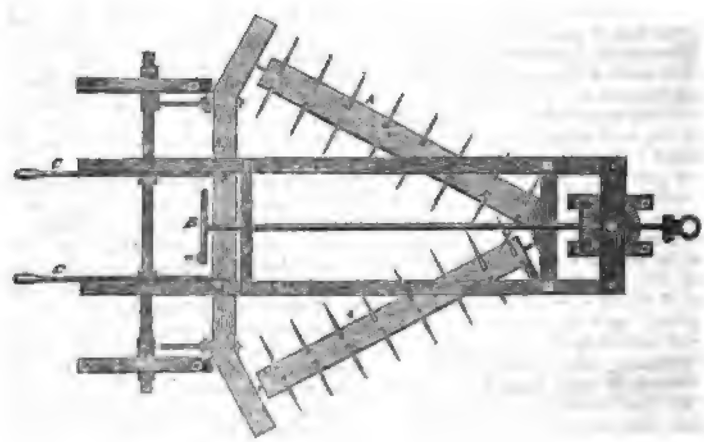
	Month of September, 1857.	1858.
Iron, pig	£152,179	£118,834
,, bar and rod	512,879	443,561
,, wire	18,093	18,709
,, cast	54,298	102,126
,, wrought	388,437	308,611

Since our last notice the Ironmasters, quarterly meetings have been held. They resulted in the trade determining that the rates that have prevailed in the latter part of the past quarter should be maintained—that is, 10s. less than was determined upon at the meetings of the previous quarter. At these rates business will be done by the first-class houses so long as they can do business at them. Houses of less note will scarcely ask those rates even now. In fact, at the present time there is much iron changing hands at below that standard, but it is not of the quality that should go out of the districts that bear a name for the excellency of their iron. When, however, the first-class firms experience a difficulty in keeping their order books sufficiently well supplied with entries, and they think that lower rates will better their condition in this respect, they will not consider themselves bound irrevocably to adhere to them; for the fixing of prices is every quarter becoming more like a relic of the past. The houses belonging to the Association, as well as those which are not of that number, are now understood, when they treat with customers, to "do the best they can for themselves."

There has been some little difficulty experienced by some masters in the iron trade, both in South Staffordshire and West Yorkshire, in particular in the past month, from a strike amongst some of the colliers of those districts respectively. In the former district, however, the men have returned, most of them after a strike of sixteen weeks against a drop of from 5s. to 4s. a day, without having been able to obtain that for which they had been standing out. They say, however, that they shall come out again in three weeks if they are not met by the masters. Others who had been before reduced have been unsuccessfully demanding a return from 4s. to 5s. In West Yorkshire the men continue to resent a notice of a reduction to the extent of fifteen per cent., and their masters, with a terseness not to us the most pleasing under the circumstances, refuse either to parley or to give more than the reduction which we have mentioned leaves as the wages of the workman.

GREEN'S IMPROVED IMPLEMENT FOR HARROWING AND BREAKING UP LAND.

Mr. Edward Green, sen., the well-known engineer of the Phœnix Works, Wakefield, has just completed a patent for an invention which consists in certain ar-



rangements of spike rollers, which are set at angles with the line of the draft of the implement. When two rollers are used they will lie with their axes inclined at an

angle to each other. These rollers have a number of spikes, teeth, or blades, fastened to their outer circumference, to act as harrows, pulverizers, or scarifiers, for cleaning and breaking up the land. The rollers will be allowed to revolve either continuously or at intervals, so as to rid them of the earth or weeds. When mounted on wheels, with levers, etc., the rollers can be raised and lowered, as circumstances may require.

In the annexed engraving we have represented, in plan view, one of the improved implements. A, A are the inclined rollers furnished with spikes, teeth, or blades, *a*, *a*. B is a handwheel, connected with an arrangement of rods and mitre-wheels, for elevating and lowering the rollers. C are levers, for the same purpose. D, D are the running wheels of the machine. The construction of the frame of the machine, and the manner in which it is combined with the several parts, are evident on inspection of the engraving.

SOUTH WALES INSTITUTE OF ENGINEERS.

This Institution, which was commenced about fifteen months ago, held an important meeting in Cardiff at the town hall on Wednesday last, under the presidency of Mr. Ebenezer Rogers, of Abercarne. A large number of models of various mechanical contrivances for mining operations were exhibited. There was also on the table a beautiful model of a new tipping staith, which is now being erected at the East Bute Dock, under the superintendence of Mr. Clark. This is a "twin" staith, the object of which is to tip coal into a large vessel at both hatchways, so that a cargo of 1,200 tons may be put on board in a few hours. This staith is especially designed also to effect another important object, that of lowering the coal by a very simple contrivance into the vessel's hold at any depth, to prevent the coal being broken; it being a desideratum to keep the steam coal whole as much as possible. The business of the meeting consisted, in the first place, of some routine matters, and then several papers were read:—On the Somersetshire coal-fields, by Mr. Greenwell; on Brunton's ventilating fan, by Mr. Huxham; on the inventions of Henry Cort of the puddling, balling, piling, and faggoting processes, and grooved rollers for the manufacture of bar iron (showing the universal use of these inventions for more than half a century), by Mr. Thomas Webster, F.R.S., barrister-at-law, who is now drawing up a memoir of this great benefactor to the British nation; on the comparative value of fuels, by Mr. Fryer, master of the Bristol Mining School. There was another paper by the president, but time did not admit of its being read at the meeting. Discussion followed the reading of each paper except Mr. Fryer's, which was deemed so important as to warrant the Society taking it up again.

A large amount of valuable information was given in the papers and during the discussion, the whole of which will appear in the printed Transactions of the Society. A large dinner party afterwards assembled at the Cardiff Arms hotel, when Mr. Rogers again presided with his usual ability. Mr. Menelaus, the late president, was vice-president. This gentleman represented the greatest iron works in South Wales, the Dowlais Company, and, in proposing the health of Mr. Richard Cort, who was present, the only surviving son of Henry Cort, most generously and honourably declared, "They were all living by Henry Cort's inventions;" to which Mr. Cort replied, expressing himself highly gratified by such a tribute to the memory of his father from the representative of the greatest iron works in South Wales. The health also was drunk of Mr. J. Evans, local secretary to the Committee, who had so ably promoted the objects of the meeting. It is intended, we believe, to hold the future meetings of the society at the principal towns of this district alternately. This will no doubt tend to enlarge the influence and usefulness of a society that is calculated to do a great amount of good.

THE MINIÉ RIFLE.

At the lecture recently delivered at Willis's-rooms (the United Service Institution being closed for the season) on Minié bullets, wooden plugs, &c., by Mr. Boucher, late of the 5th Dragoon Guards, we were happy to find that certain facts transpired which place the claims of our gallant countryman Captain Norton over the French Captain Minié to the invention of the most perfect system of elongated projectiles beyond all manner of doubt. The lecture was presided over by Colonel Sykes, M.P., and was numerously attended by officers of the Army, and the leading gun firms of the metropolis.

The lecturer commenced by observing that new doctrines are frequently based on false foundations, which proved to have been the case with what is termed the Minié principle, which consisted in the introduction of iron cups into cavities at the flat end of elongated projectiles, with a view of causing an expansion of the lead into

the grooves of the barrel. This alleged improvement we immediately adopted, as a *foreign invention*, when the Duke of Wellington expressed such apprehension of a French invasion shortly before his death, when our smooth barrels and spherical balls would, in addition to the numerical inferiority of our army, have exposed us to a degree of danger that threatened most serious results. During the Crimean campaign, however, it appeared that those iron cups were productive of greater evils than those they proposed to remedy, as they were driven through the softer metal by the force of the gunpowder, leaving the lead behind stuck so fast in the barrel as to render it useless for the remainder of the day. After fifty millions of these iron cups had been ordered and manufactured by Greenfield, of Broad-street, Golden-square, our wiseacres of the War Department set to work in forming wooden plugs as substitutes, on the merits of which, it appears, from the following observations of the lecturer, the authorities of the Hythe School of Musketry, and those of the Ordnance Department at Enfield, differed:—"In the laboratory at Woolwich, ten machines were erected for making box-wood plugs at the rate of 300,000 per diem. We apply to Colonel Wilford, of the Hythe School, for information as to their intended use; he tells us that for three years he has been teaching his pupils that they are expanding agents for rifle bullets. Feeling somewhat doubtful on this point, we turn to Colonel Dixon, of the Enfield School; he shakes his head, and thinks that they are only useful in protecting the edges of the bullets from collapsing. In this dilemma we make an appeal to the bullets themselves, after having been discharged, and by signs which are far more intelligible than the most elaborate explanations of the Minié advocates, they declare that Colonel Dixon is to a certain extent right, and Colonel Wilford totally wrong, as only about one-third of them do even the duty of protectors; consequently two-thirds of these machines are working in vain; thus, out of the millions made, and the thousands of pounds of public money expended, not one plug does the duty assigned to it." The speaker finally adverted to a variety of other interesting facts to prove the incompetency of our military authorities, and the consequent waste of public money. The Chairman complimented the lecturer on the light he had thrown on so valuable an improvement as the rifle invented by Captain Minié, to whom the military world stood so much indebted, and begged at the same time to observe that he took no part in the controversy between the parties adverted to by the lecturer, as he merely presided in order that important questions should be elucidated by free discussion. On this Major-General Sir John Scott Lillie begged to remind the gallant Chairman, as the elucidation of truth appeared to be the object of the meeting, that nothing could be more at variance with that object than giving the merits of this great improvement in the art of war to Captain Minié, or any other foreigner, unless Irishmen were still considered aliens, as he perceived at the further end of the room a gallant countryman of his, and old brother campaigner of the Peninsular War, Captain Norton, to whom all the merits of elongated shot and shell were due, as was proved by his having submitted them to the authorities at Woolwich long before they were ever adopted in France, a fact proved also by the evidence of Lord Rosse, late President of the Royal Society, who witnessed various trials by Captain Norton at his seat in Ireland, upwards of thirty years ago, of these elongated projectiles, which had been rejected by our military authorities, and only adopted as foreign importations when approved of and adopted by the French Army. As regarded the controversy between the advocates of iron and wooden plugs for the projectiles, Sir John observed that, having himself commanded a rifle corps during the Peninsular War, and having subsequently directed his attention to the improvement of elongated projectiles, his opinion was that all advocates for expanding the lead by plugs or cups were in error, as the solid bullets he found by experience required no such factitious aids, the action of the gunpowder gas on its explosion being quite sufficient to force the lead into the spiral grooves of the barrel, as originally proved by Captain Norton. All deviations were consequently only iron or wooden masks to cover the piracy, and afford pretexts for rewarding pirates. The gallant Chairman apologized to the gallant Captain for his ignorance of these facts, and an animated discussion ensued, in which the gun-trade took a part, some of whom declared that they had Captain Norton's original solid projectiles, as then described, in their possession upwards of thirty years, and they could only attribute their rejection by the authorities at Woolwich to an indisposition to recognize any improvement in the art of war not emanating from themselves, and an apprehension that improvements in rifle shooting would throw field artillery into the shade by depriving them of the monopoly of long ranges which they heretofore enjoyed. When Captain Minié was rewarded by his Government for covering his piracy of Captain Norton's

projectiles by an iron mask, and when the War Department rewarded a favoured candidate with a large sum of money for taking off this iron mask, and leaving this elongated projectile as originally devised by Captain Norton, and another candidate in like manner rewarded with public money for devising wooden plugs for expanding purposes, for which they have proved quite useless, it is a reflection upon our Military Authorities to have it said that the gallant veteran to whom all the merit of the original idea is so justly due, should still remain disregarded and unrewarded. But it unfortunately happens that the advocates of the *Dowb School*, and of the *Woolwich Committees*, consider it preferable to persevere in error than to recognize an act of injustice, which would be construed into an admission of their incompetency or disinclination to appreciate the merits of Captain Norton's valuable improvements when first laid before them. We must, however, hope, for the honour of the country, that the time is fast approaching when the people will no longer tolerate such a system, which rendered us the laughing-stock of the French Army during the Crimean War, where merit alone is recognized. We have reason to believe that Captain Norton's claims will be investigated by a Parliamentary Committee early next session.

PROMOTIONS IN HER MAJESTY'S DOCKYARDS.

Gentlemen,—As I have taken more interest in the welfare of the Royal Dockyards, probably, than any individual in or out of the service, and as I was the first to define every class of promotion in those expensive establishments, in my correspondence with Sir James Graham, eighteen months before those changes which have since worked so badly and unjustly were made by that First Lord and his Whig office-seeking colleagues, who made everything subservient to political purposes, I should be sadly neglecting my duty were I not to approve of the notice you have taken of the subject in your last Number, page 396. As you mention the cost of training a candidate for dockyard promotion at the late scientific school at Portsmouth, as amounting to about £1,200,* I beg to state distinctly, that I clearly defined the principle of training young men free from all expense to the Government, beyond that of examination, as my object was not to *force* superficial ability, but to duly reward by appointment the ability required when found, and to this I will add, it was sure to be found in excess of its requirements under the principle which my personal experience and attention prompted me to place, clearly and fully, at the service of the reform-professing First Lord of the Admiralty, whose object I so evidently mistook.

Your notice of Sir Baldwin Walker, to whom I have the pleasure of being known, is just, for he is an indefatigable and valuable officer, and would have made even a better Comptroller than Surveyor of the Navy. But, however impartial he may be, how was he to prevent the appointment of men politically selected by the Admiralty? And there are those now about to retire on a pension of £650 per year, who were politically selected by the reform naval administration, for whose full services no private establishment could have afforded to give £200 a year; and you must understand I speak as I know, and not as I am told, and challenge the Government to contradict me if it can. I am a great advocate for paying every man his full value, but, as the Government knows not the value of its servants rightly, the service is seriously injured by too frequently paying men above their value. Both overpaying and underpaying are injurious, and, of the two, overpaid men are worse than the underpaid, so far as the true subordination of the service is concerned. This part of the question I particularly pointed out at the time Sir James Graham was concocting his astounding dockyard changes, which gave such general dissatisfaction to the men when adopted.

You are perfectly right in your remarks relative to the unjust Admiralty resolution, that promotion in the dockyards should be dependent on the defective examination test—a rule which they were the first to break for *political purposes*, to my certain knowledge. It was bad in principle, because the practical man of experience was sacrificed by appointing over his head those who, as you truly observe, had "a mere smattering of algebra and Euclid."

Appropriate knowledge is demanded. I could myself find in one establishment young gentlemen capable of passing an examination for B.A. at sixteen years of age, splendid naval-architectural and mechanical draughtsmen, with a very sound knowledge of the theory of mechanics; but I should not be weak enough to appoint them, even at a maturer age, to preside over the practical mechanical duties of the dockyards. But, unfortunately, the Government mistakes learning for knowledge,

* We fear that, in making our rough calculation, we in some manner,—probably by mistaking three years' expense for one year's,—wrote £1,200 for £400, which is about what the sum stated should have been.—Eds. M. M.

or the scaffolding for the building, in by far too many of its appointments.

I am very glad to find that the present Government has discovered its baneful tendency, and, if Sir John Pakington has resolved to restore the dockyard establishments to what they should be, and to what they may be made with less expense to the country, and will allow me to call his attention to the perverted meaning of my original suggestion for promotion in this branch of the public service, I will again go over the work. But not for Her Majesty's crown would I attempt it, if he has no better idea of the subject than the minister who made such a bad use of my former exertions.

I am, Gentlemen, yours, &c.,
OBSERVER.

London, Oct. 23rd, 1858.

STEAM RAMS.

To the Editors of the Mechanics' Magazine.

GENTLEMEN,—As I hold the manuscript copies of the plans and original correspondence relating to what are now named "steam rams," and seeing that public attention is again called to their "origin" by my friend Sir Charles Fox, in a letter published in the *Times* of the 12th inst., and just brought under my notice, I request the favour of your allowing me to place before your professional readers a few plain facts relative to this formidable class of vessel now being built at Cherbourg as the invention of Louis Napoleon, who bears the name of their inventor much in the same way as Viscount Palmerston was presumed to be the author of the notorious "monster mortars" invented by R. Mallet. We are indebted to Vice-Admiral Sir George Rose Sartorius for the explanation as to which way the Emperor of the French was induced to construct the *vaisseau bélier*, to be used against us in return if required.

Immediately Admiral Sartorius's letter in the *Times* of the 14h of September was made known to me, I addressed a letter on the 15th to the editor in corroboration of the deadly power of the "steam destructives," as I always called them—far greater than that described by the Admiral, with ample explanations of their origin, and the manner in which they were refused by Sir James Graham, and his successor at the Admiralty, Sir Charles Wood, both before and after the war with Russia was proclaimed, and consequently before the "floating batteries" were adopted by France, with whose ambassador, M. de Persigny, the British Admiral was instructed by the First Lord of the Admiralty to communicate.

As the political editor of the *Times* declined to publish my letter, I brought under your brief inspection the original invention, together with a number of impregnable ships and vessels varying from one to 160 guns of the largest calibre, designed by me expressly for our coast defence, and it will be recollected that I stated my iron shot-proof land batteries were commenced in 1829, and my impregnable ships, so called in the manuscript, in 1839. As Sir Charles Fox so honourably discharged his duty to his friend Mr. James Nasmyth, by stating that he was present when a steam ram was submitted by him to Lord Haddington, then First Lord of the Admiralty, "upwards of thirteen years since," I feel it right to observe that in 1838 I first became personally known to Sir Charles in connection with my then patented improvements in naval architecture; and, although he knew how things stood with me and the Admiralty, I believe his statement literally correct; and, although my naval affairs in 1828 were known to Sir George Sartorius and a great number of naval gentlemen, we had no discussion about steam rams, as they were not then invented.

After an absence of nearly ten years from England, I returned to see the late King, when Lord High Admiral, on the subject of important naval improvements, in September, 1827, and it was then I first became known to Admiral Sir George Cockbourn, who for fifteen years took a strong interest in my affairs with the Admiralty, in consequence of the extreme injustice I had experienced from the Navy officers and the Whig Administration, and, when he returned to power with the Earl of Haddington, the Right Hon. Earl of St. Germains requested the First Lord of the Admiralty to give to those affairs his personal attention; but, as Sir George Cockbourn and the Under-secretary, Sir John Barrow, found an open investigation would lead to an inquiry which they did not wish to be opened, it was "burked" without the knowledge of Lord Haddington, as his lordship pledged me his honour. I merely mention this now, to show in which way at that date my impregnable ships were deprived of that consideration which the Admiralty were called upon to give them.

This day week I selected seven examples from the plans I showed you, and submitted them to the present First Lord of the Admiralty, Sir John Pakington, with the request that he would place them before the First Minister of the Crown, Lord Derby, that it might be seen in which way such ships as the *Marlborough*, *Wellington*, and *Royal Albert* can be destroyed without

the chance of escape if the "steam destructives" can reach them, and which they will be sure to do in the open sea, and even in port if the land batteries are not rendered impregnable on the principle which I have so urgently pressed upon the notice of the Minister-at-War. That principle Mr. George Rennie brought under discussion at the last meeting of the British Association, and I am glad to say he is not the only one who acknowledges its importance, and England's Government must adopt it very extensively if our ports and harbours are to be kept out of the reach of impregnable steam destructives, such as those to which the present First Lord of the Admiralty is respectfully called upon to give his most serious consideration.

If France, through the advice of Sir John's predecessor, Sir Charles Wood, has resolved to demonstrate in which way the present expensive ships of war can be rendered useless, Sir John Pakington must not allow the country to suffer further by neglect. It is due to Her Majesty and the country (as I have felt it to be my duty to state to the First Lord recently), to see that we are prepared to meet results which inefficiency will be as certain to develope as the rising of to-morrow's sun. Among the plans which I brought under your professional notice, and those which the First Lord of the Admiralty has done me the honour to return in compliance with my request, will be found steam rams, as now called, as superior to those described as about to be built or building at Cherbourg, as the original "floating batteries" so *politely* refused adoption when suggested by me are superior to those which we were prompted to follow, after having given France the opportunity to construct the example.

The national importance of the subject, Gentlemen, will, I am sure, be considered by you and your readers a sufficient apology for the space which my letter will occupy in your valuable paper; and, with your permission, I will at some fitting opportunity endeavour to resume my remarks, with the humble hope that my exertions to render England safe against invasion by the construction of "floating and fixed shot-proof batteries" will not have been made in vain.

I am, Gentlemen, yours, &c.,

JOHN POAD DRAKE.

London, Oct. 16, 1858.

[We were surprised at the number of practical examples which Mr. Drake placed before us on this subject, and, as we stated to him at the time, it appears to us that he must have devoted his whole life to the production of inventions for the good of the country, instead of making money after the fashion of most other professional gentlemen. We hope his services will, at least, be weighed with justice, and meet with that return from the Government which they may be found to deserve. Judging from what we have seen of his labours, while we are not prepared to say that he has satisfied us as to all the details involved in his plan, we are confident that no one man has yet given public proof that he has either worked half so hard or devised half so many plans as Mr. Drake. To prevent misconception, however, we may add—what but very few are aware of—that Sir Baldwin Walker, the Surveyor of the Navy, has not only had the construction of iron shot-proof ships, &c., under his consideration for some years past, but has had designs prepared for giving the best practical form to such ships. The difficulties to be overcome, however, are very great, and such as few non-professional persons can fully comprehend. The immense cost of such vessels is alone sufficient to effectually check everything like overhaste in their introduction.—EDS. M. M.]

Mr. Robert Mallet, of Dublin, writing upon steam rams, and referring to Sir Charles Fox's letter of the 11th instant, published in the *Times* of the 12th, says:—"I can confirm Sir Charles's statement of Mr. James Nasmyth having about thirteen years ago independently invented and promulgated everything that has since been re-proposed as to steam rams. But I happen to be further in a position to trace back the invention or proposal to a still earlier date and inventor, whose name should not be passed over as first inventor until some yet higher antiquity of inventorship shall appear. About the year 1835, or twenty-three years ago, Captain Richard Bourne, R.N., one of the earliest promoters of the Peninsular and Oriental Steam Company, while managing director of the old Dublin and London Steam Navigation Company in Dublin, frequently and publicly promulgated his views of the use of steam rams, that should (as he expressed it) 'break any ship-of-the-line like an egg-shell.' And upon one occasion he fully detailed his notions of constructive detail to myself and to the late Mr. Francis Humphreys, then marine engineer to the company, and well known as the originator of trunk engines, in those designed by him on board the *Wilberforce*. I have some reason to think that Captain Bourne about that time also communicated his views to the Admiralty."

TELEGRAPH CABLES.

GENTLEMEN,—In a great undertaking like the Atlantic Telegraph, people, instead of abusing those connected with the company for not anticipating results which have unfortunately ensued, should recollect that the shareholders have expended their money upon an enterprise which, although unsuccessful, will point out the way in which an Atlantic cable may be made to answer, and a company of shareholders to reap a rich harvest, as the reward of what was originally a hazardous investment in a great national undertaking. I hope, however, that, for the future, the Atlantic Company will direct that all the proceedings in reference to this or the new cable, its workings, &c., shall be laid before the public; in order that the engineers may have the benefit of the opinion of many outsiders who, though not "electrician projectors," may be able to give hints of some little value on the matters in question. For instance, there is, *now the cable has failed*, a great cry of "Why was it not tested in water?" Now, an intelligent friend of mine, anticipating a failure from defective insulation, proposed a test which would infallibly have discovered the defect in the insulation, if it existed before its being submerged. His letter appeared page 298 of the *Practical Mechanics' Journal* for February, 1857. The plan of testing he proposed was, to construct large cast-iron tanks, in which some hundred miles of cable could be placed, with stuffing-boxes where the wire enters and leaves the vessel, and then subjecting it to hydrostatic pressure; the insulated wire to be connected through a galvanometer with one pole of a powerful intensity battery, and the iron of the tank in which the cable was enclosed with the opposite pole. Was the cable tested in this or a similar manner?

The directors should recollect that submarine telegraphic science is, as yet, in its infancy; and that it is perfectly absurd to keep their proceedings secret, or to refuse to adopt a good idea because it does not happen to emanate from an "electrician projector." Some of the reasons given for observing secrecy are ridiculous. For instance, Mr. Brett, as reported in your Number of Oct. 16, speaking of a new cable which he hopes the Atlantic Company will lay, says:—"I must be excused from going into further detail, as patents may arise on all sides to stop its progress by claims such as those now preferred on the most futile grounds;" whereas the very mode of preventing these claims upon "futile grounds" would be to "publish" the intended scheme, which would effectually prevent any person protecting the idea by a patent.—I am, Gentlemen, yours, &c., J. T.

PATENTS FOR DOUBLE PHOTOGRAPHIC PRINTING.

A correspondent of the *Photographic News* writes:—

"SIR,—If a certain process has been practised by several persons for some years, and if that process be afterwards patented by another, does that patent hold good? I put this question because in your last appears a paragraph extracted from the *Mechanics' Magazine* relating to a patent taken out by Mr. Sarony, of Scarborough, for printing from various negatives. This system has been in use for many years. The first description of it, I remember, appeared in the *Photographic Journal*, September 21st, 1855, by Berwich and Annan; it has also been carried out very successfully by Mr. Rejlander, Mr. Robinson, and others, as you are well aware.

"I have not seen any specimens of Mr. Sarony's wonderful new invention, but I have heard that its chief value, as applied or misapplied to portraits, is, to put an old head on young shoulders; the head being taken from the person to be represented, the body from another person, and, perhaps, the hands from another. It is related that Zeuxis, some two thousand years ago, painted his famous picture of Helena from five of the most beautiful virgins the town of Cratona could afford, 'uniting all the most admirable parts in one single figure;' and Zeuxis was right: but it is pushing ideality too far, to make a photographic representation of one person from various models, *and patent it*.—LUX."

[We have not the *Photographic Journal* at hand to refer to, but we should recommend persons interested in the above subject to make quite sure that "Lux" is correct before they believe him, for he seems disposed to make *too light* of Mr. Sarony's claim. Certainly his closing insinuation is most ill-meant and unfounded. We do not know Mr. Sarony, nor are we acquainted with anything more respecting him than we stated; but there is not a word in the paragraph we published about making "a photographic representation of one person from various models," nor did we observe any such thing in the specification of his patent. If his supposed improvement is not new, his patent privileges end, of course; but, as "Lux" has thought fit to totally misrepresent the patentee in one important respect, it is by no means improbable that he has done so in the other.—EDS. M. M.]

THE ATLANTIC CABLE.—Mr. Whitehouse has published a letter in which he offers to render the Atlantic Cable efficient at his own expense, if the Directors will guarantee him a small percentage upon the messages sent for ten years.

SOUTH KENSINGTON MUSEUM.

Amongst objects of art recently lent to this museum is a beautiful series of crystal vases, cups and spoons, &c., mounted in enamelled gold and jewels, belonging to the Marquis of Salisbury, and by him deposited there. They were contained in a silver-mounted case which was found at Hatfield some years ago in a chest under a bed. Judging from the case, which is, however, of a later workmanship, they appear to have come from Spain; not improbably a trophy of war in Queen Elizabeth's reign. Together with these is a pair of silk stockings, the first made in England, and presented to Queen Elizabeth; these also came from Hatfield. Dr. Bishop has also lent for exhibition a very beautiful bas-relief, of Italian art of the 14th century, and a Virgin and Child, slightly coloured and gilt, supposed to be the work of Giotto. Both have been placed in the division of ornamental art.

Sir Charles Bright.—We believe that Sir Charles Bright, the eminent civil engineer, who has recently been knighted for his share in laying down the Atlantic telegraph, is the youngest individual on whom that honour has been conferred for many a year. He is only twenty-six years of age, having been born in 1832. He is, we understand, the third son of Brailsford Bright, Esq., and his mother was the daughter of E. Tilston, Esq. He was married, in 1853, to Hannah Barrick, daughter of the late John Taylor, Esq., of Kingston-upon-Hull. Sir Charles Bright resides at the Cedars, Harrow Weald.—*Court Circular.*

Armstrong's Patent Fuzes.—Through some untoward circumstance we printed "Mr. Robert Armstrong" for "Mr. W. G. Armstrong," in the article upon fuzes in our last Number. It is, of course, Mr. W. G. Armstrong who has done so much for ordnance, and of whose experiments we continue to hear the best accounts.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

Bousfield, G. T. *Improvements in knitting machines.* (A communication.) Dated Mar. 11, 1858. (No. 492.)

This consists—1. In mounting the needles, sinkers, and their appurtenances in a reciprocating carriage, which travels to and fro upon stationary ways. The frame also has secured to it the cam bars by which the proper reciprocating movements are imparted. 2. To ensure the uniform width of the stitches, the needles slide in grooves whose slides converge as they approach the bottom. 3. In combining with a reciprocating needle carriage a second carriage, which supports the thread guide in such a manner that the latter is caused to move along with the former after the thread is fed to the whole range of needles, but is stationary while the needles and sinkers are forming the loops, although the needle carriage is then moving. 4. In widening the fabric by causing the thread guide to pass down between one pair of needles and rise between another pair, this thread guide being moved in the mean time by a motion independent of its ordinary reciprocating movement. 5. In combining with a reciprocating needle carriage under supports which support the needles at the places where the loops are being formed, and operate to close their barbs in succession. 6. In combining with a reciprocating series of needles and sinkers stationary apparatus for imparting the necessary movements for forming the loops to different numbers of the series in succession, whereby the straining of the yarn in a flat knitting loom is avoided, and the apparatus for operating the needles and sinkers is concentrated at the centre of the loom, and may be the same whatever number of needles is employed. 7. In combining with a needle carriage apparatus for taking up the fabric after it is formed.

Verdeil, F. A. *Improvements in treating madder.* Dated Mar. 11, 1858. (No. 493.)

This consists in subjecting the pigment precipitated from an alkaline decoction of madder to the process of garancine manufacture.

Hast, F. E. D. *An improved mode of manufacturing stearine.* (A communication.) Dated Mar. 11, 1858. (No. 495.)

The inventor saponifies palm oil or other fatty matter, and places it (well washed and freed from acid) in an iron pan, furnished with a jacket to permit of the circulation of steam around it. About one-tenth part of cocoa-nut oil is then added, and the whole is boiled up. When the mixture has attained 260° Fahr. there is added fresh milk mixed with rosin. The compound is then kept well stirred for half an hour, after which the steam is shut off, and the fatty matter transferred to wooden vessels, and left to settle. It is next heated in a pan to about 160° Fahr., and run on to a hollow plate heated by steam, whence it passes to a chamber in which it is subjected to nitrogen gas and heated air. The chamber is surrounded by a steam jacket, and fitted with inclined plates, by preference of glass, set one above the other at suitable angles, to receive the fluid fatty matter as it enters the chamber through a perforated pipe, and transmit it in a thin film from one to the other, while it flows downwards. A pipe at the bottom draws it off into cooling vessels. Heated air and free nitrogen are forced into the chamber as the fatty matter enters. The separation of the stearine from the oleine is thus effected. The cooling vessels are boxes packed with ice. The solidified mass is subjected to pressure, to mechanically separate the stearine.

Worrall, J., and C. Race. *Improvements in machinery or apparatus for stretching and drying fabrics, part or parts of which said apparatus are also applicable to other machines wherein fabrics are required to be distended.* Dated Mar. 12, 1858. (No. 497.)

This consists in making the bottom of the lower end of the stretching pins (or the cloth line) coincident with, or upon the same level as, the centre of the axes on which the links of the chains work as hinges, so that when the fabric is distended it will also be coincident with or upon the same level as the hinged centres of the links of the chain. By such arrangement the fabric may without injury from tearing (whilst distended) be passed around rollers or drums in an endless band, and submitted to the action of heat.

Smith, M. *Improvements in looms for weaving.* Dated Mar. 12, 1858. (No. 498.)

This consists, 1. In the application of two endless chains to those looms in which three or more shuttles are employed, one chain to regulate the number of picks to be thrown with each shuttle, and the other to regulate the position of the drop-box. 2. In applying to looms having a shuttle-box with several compartments at each end a chain to regulate the picking motion in combination with the two chains above referred to. 3. In a mode of giving motion to the heddle roller shaft; 4. In a mode of giving motion to the picking shafts of those looms in which the picking peg is fixed to a diagonal shaft for bringing the picking peg in a line with or beyond the reach of the picking stud.

Warburton, J. *Improvements in carding engines.* (Partly a communication.) Dated Mar. 12, 1858. (No. 499.)

These consist, 1st. In apparatus for raising the flats or sheets of cards from the card cylinder, and for cleaning the same when lifted. 2nd. It relates to engines for carding silk, and consists in speeding the stripper, and taking it a certain distance from the cylinder, to allow the long silk to accumulate upon the strippers, and then to doff the long silk off to be combed and spun.

Thompson, T. *Improvements in vats for cheese-making.* Dated Mar. 12, 1858. (No. 500.)

This consists of apparatus to act upon the curd when removed from the pan for forcing out the remaining whey. A circular vessel has fitted a false perforated bottom, kept a certain distance from the real bottom by ribs on its under side. On this the curd is placed. Actuated by a screw, a perforated presser descends upon the curd and forces out all the whey.

Chellingworth, T. T. *Improvements in suspending chandeliers and gas pendants.* Dated Mar. 12, 1858. (No. 501.)

This consists in suspending chandeliers and gas pendants by the use of helical or coiled springs variously arranged.

Pearson, W. *A new or improved washing machine.* Dated Mar. 12, 1858. (No. 502.)

This circular washing machine consists of a fixed and moveable rubber, upon the working surfaces of which strips of wood, zinc, or other material of a fluted or undulating figure, are disposed in a nearly radial manner, the articles being washed between fixed and moveable rubbers.

Newton, A. V. *A new combination of instruments for extracting teeth.* (A communication.) Dated Mar. 12, 1858. (No. 506.)

This invention (which occasioned so much controversy in the *Times*) consists in combining with a common dental forceps a magneto-electric machine, in such manner that a wire from one pole of the machine shall form a metallic connection with the part of the forceps that grasps the tooth, while the other pole is brought into connection with the patient's hand by a second wire. The handles of the forceps, which are held by the operator, are insulated.

Corbelli, L. F. *An improved process for extracting aluminium from its compounds, and obtaining at the same time protochloride of mercury.* (Partly a communication.) Dated Mar. 12, 1858. (No. 507.)

The patentee takes rock alum and chloride of calcium, or rock alum and chloride of sodium, or sulphate of alumina and chloride of calcium (or other salts having alumina for their base instead of the above), well dries and pulverizes the mixture, and dissolves it in water. The liquid is then filtered, and placed with fluid mercury in a non-conducting vessel, and a weak current of electricity is passed through the two. The salts of alumina are thus decomposed, and the aluminium is deposited upon the zinc plate of the battery. Proto-chloride of mercury (calomel) will also be deposited in the surface of the mercury at the bottom of the vessel.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

Gough, J. *Improvements in horse-gear for driving machinery.* Dated Mar. 15, 1858. (No. 521.)

This consists mainly in the use of a horizontal endless band or strap, extended upon driving pulleys, which are slacked on to vertical driving shafts having secondary driving pulleys or toothed wheel gear actuating the machinery. The horses are yoked to the horizontal driving band.

Tellier, L. J. *Improved machinery for raising water and other liquids.* Dated Mar. 15, 1858. (No. 523.)

This consists of a liquid elevator formed of an endless belt, to which buckets are attached. The belt and buckets are made to pass over or around two drums or pulleys, one free to revolve in the well, and the other free to revolve upon being set in motion by a crank handle or otherwise. The buckets may be made open both top and bottom, each with a cover attached to the belt, so that upon each bucket rising, and before leaving the supply, a cover comes under and encloses the bottom of the bucket.

Taylor, W. G. *Improvements in preparing skins for tanning.* Dated Mar. 15, 1858. (No. 524.)

The means which the inventor employs for removing the fur from the skins are knives, so arranged as to act on the surface, or cylindrically to remove the fur close to the pelt, the skin being adjusted so as to come in continuous contact with the edges of the knives.

Ferry, A. *Improvements in cornets and other wind musical instruments.* (A communication.) Dated Mar. 15, 1858. (No. 525.)

Instead of making the valve holes of cornets, &c., in contrary directions the inventor makes them all in one direction, so that the valve notes will be quite as free in tone as the open notes.

PROVISIONAL PROTECTIONS.

Dated June 30, 1858.

1472. B. Nicoll, of Regent-circus. Improvements in circular knives and saws.

Dated August 16, 1858.

1870. P. Richard, of Paris, engineer. Improvements in apparatus for obtaining motive power.

Dated August 25, 1858.

1928. J. Dredge, of Walcot, Somerset. Improvements in condensers for steam engines, and in pumps for working such condensers, or for lifting water from deep mines, and for any other use to which pumps are applicable.

Dated August 26, 1858.

1936. G. M. Sautter, of Paris, gentleman. Improvements in telegraphs. A communication from D. P. Rodier.

Dated September 10, 1858.

2050. J. L. Chester, of Philadelphia. Improvements in self-priming apparatus for fire-arms, and in the preparation of percussion primers to be used therewith. Partly a communication.

2054. J. H. Johnson, of Lincoln's-inn-fields. Improvements in Jacquard machines. A communication from M. Bouteille.

Dated September 11, 1858.

2062. W. Baker, of Hull, merchant. Improvements in preparing food.

2064. J. M. Courtauld, of Braintree, Essex, crape manufacturer. An improvement in clearing and preparing silk-crapes, aerophanes and other like fabrics, lisses and other gauzes and lace, and in machinery employed therein.

Dated September 13, 1858.

2076. R. Frost and A. Rigg, of Chester. Improvements in apparatus for cleaning grain or seeds and bran.

Dated September 14, 1858.

2084. W. J. Hoyle, of Huddersfield, and R. Howson, of Lancaster, engineers. Improvements in arrangements and mechanism, or apparatus for signalling by sound.

Dated September 18, 1858.

2104. G. Ostermoor, of Basinghall-st. Ornamenting boas, victorines, and muffs.

Dated September 20, 1858.

2112. J. L. Chester, of Philadelphia. An improved cartridge opener and ramrod fastener. Partly a communication.

Dated September 24, 1858.

2144. B. T. Wright, of Wolverhampton, engineer. A new or improved method of, and apparatus for, preventing the explosion of or injury to steam boilers through deficiency of water.

Dated September 25, 1858.

2152. A. F. Delacroix, of Chartres, France, watchmaker. Improvements in locomotive engines.

2156. C. Hall, of Navestock, Essex, esq. Improvements in apparatus for applying power to the cultivation of the soil.

2158. J. C. Dieulafait, merchant, of Paris. A kind of garment which may receive different forms according to the will of the wearer.

Dated September 28, 1858.

2164. R. Lewthwaite and G. Ambler, of Halifax, York, watch-makers. Improvements in clocks, watches, chronometers, and other time-pieces.

2166. J. H. Linsey, of Grocers'-hall-court. Certain improvements in binding or covering books.

2168. J. L. Clark, of Haverstock-hill. Improvements in coiling and securing telegraph cables preparatory to laying them from ships or vessels.

Dated September 29, 1858.

2170. J. Luis, of Welbeck-st. A new method of fixing pastel pictures. A communication.

Dated September 30, 1858.

2174. J. Wright, engineer, of Birmingham. Certain improvements in the mode of arranging and moving fire-bars for locomotive, puddling, and other furnaces.

2176. S. Taylor, of Rochdale, mechanic. Cerain improvements in apparatus to be used as a fire-escape, which improvements are also applicable o other similar purposes.

2178. H. Kinsey, of Nottingham, machinist, and W. H. Morrison and S. Smithard, of Nottingham, manufacturers. Improvements in means or apparatus for the purpose of folding lace or other fabric, and also for cutting the same into lengths adapted to be used in the manufacture of bonnet and cap fronts, and for other purposes of millinery.

2180. C. W. Siemens, of John-st., Adelphi. Improvements in electric telegraphs. Partly a communication.

2182. G. Uhlhorn, of Grevenbroich, nr. Cologne. Improvements in applying motive power to give motion to machinery.

2184. F. J. Money, of Thaxted, Essex, surgeon. Improvements in the construction and adaptation of sewers.

Dated October 1, 1858.

2185. W. Blake, of Harley-st., Bow. An improved portable fire-escape.

2186. J. T. P. Newbon and T. Smith, of Fenchurch-st., naval architects, and J. Brown, of Tollit-st., Mile-end, engineer. An improved method of lifting and lowering ships' anchors.

2187. M. Hipp, of Berne, Switzerland. Improvements in electric telegraphs.

2188. J. W. Wilkins, of Temple-chambers, telegraph engineer, and J. B. Dunn, of Great Winchester-st., gentleman. Improvements in constructing electric telegraph cables.

2189. Sir E. Belcher, of Charing-cross. Improvements in the manufacture of telegraphic cables.

2191. H. Bradbury, of Whitefriars. Improvements in producing printing surfaces from engraved plates.

Dated October 2, 1858.

2192. J. Rogers, of Queen-sq., City, rope-maker. Improvements in submarine electric telegraph cables.

2193. L. D. Owen, of Tottenham-court-road, engineer. Improvements in ploughs for digging up potatoes, and for other purposes. A communication.

2194. W. Brierley, of Cleckheaton, machine maker. Improvements in looms for weaving carpets and other fabrics.

2195. H. Monier, of Marseilles, manufacturer. A new gas burner.

2196. B. Samuelson, of Banbury, engineer. Improvements in the wheels of carts and other carriages to be used on common roads.

2197. H. G. Collins, of Paternoster-row. Improvements in the production of blocks or surfaces to be used in printing.

2198. J. C. Holman, of London-st., Fitzroy-sq., and E. W. Holman, of Grafton-st., Fitzroy-sq., pianoforte makers. An improved pianoforte action.

2199. A. V. Newton, of Chancery-lane. An improved governor for marine and other steam engines. A communication.

2200. S. Stimpson, of Islington, engineer. An improved construction of fagot or fire-lighter.

Dated October 4, 1858.

2201. R. Dolby and J. Gates, of Liverpool, enamellers. An improved process of transfer printing, and ornamenting on glass and other transparent substances.

2202. L. A. Normandy, jun., of Judd-st. An improved apparatus for the prevention of boilers exploding from a deficiency of water. A communication.

2203. L. A. Normandy, jun., of Judd-st. Improvements in the manufacture of sulphate of copper. A communication.

2204. M. Van Peteghem, of Ghent, organ builder. Improvements in looms for weaving figured fabrics. A communication.

2205. F. Trevithick, of Penzance. Improvements in applying sails and keels to boats and vessels.

Dated October 5, 1858.

2206. J. Mills, of Manchester, machinist. Certain improvements in machinery or apparatus for roving, slubbing, or spinning cotton and other fibrous materials.

2207. A. Bessemer, of Upper Holloway, gentleman. Improvements in the manufacture of iron and steel, and in apparatuses to be employed therein.

2208. C. E. Oldershaw, of Aldershot, Major R.A. An improved method of constructing electric telegraph cables.

2209. W. Menelaus, of Dowlais Iron Works, Glamorgan, manager. Improvements in machinery for straightening rails and wrought-iron bars.

2210. M. Henry, of Fleet-st. Improvements in the means of or arrangements for working steam expansively. A communication from C. Polonceau.

2211. J. H. Brown, of Romsey. Improvements in the manufacture of projectiles.

2212. G. Hamilton, of St. Martin's-le-Grand, and W. H. Nash, of Poplar, engineer. Improvements in locks.

2213. J. H. Brown, of Romsey. Improvements in the manufacture of cartridges.

2214. J. Milnes, of Cross Hills, near Leeds, overlooker. Improvements in weaving fabrics where cross weaving is employed.

2215. G. Lovett, of East-st., Manchester-sq., medical shampooer. Improvements in portable apparatus for administering hot-air, vapour, and shower baths.

2216. M. Jacoby and F. R. Ensor, of Nottingham. Improvements in the manufacture of bobbin-net or twist lace, and other fabrics made in twist-lace machines.

Dated October 6, 1858.

2217. J. Luis, of Welbeck-st. A new method of joining sheet iron, cast iron, gutta percha, and other tubes, by means of muffles. A communication.

2218. G. Heppell, of Newcastle-on-Tyne, engineer. Improvements in the construction of boilers, furnaces, and flues.

2219. G. Collier, of Halifax, York. Improvements in winding machines.

2220. M. Harnett, of Pimlico, watchman. Improvements in preventing incrustation in steam boilers. A communication.

2221. C. Hill, of Chippenham. Improvements in omnibuses and in apparatus for upholding the windows of omnibuses and other carriages.

2222. J. Ridsdale, of Stoke Newington, accountant. An improved reservoir or fountain pen.

2223. W. Malam, of Clapham-road, gas engineer. Improvements in apparatuses for the manufacture of gas.

2224. D. Scattergood, of Nottingham, machine builder, and R. W. Smith, of Nottingham, hosier. Improvements in machinery for the manufacture of looped fabrics.

2225. C. Baylis, of the Poultry, solicitor. An improved mode of constructing and arranging underground chambers in populous cities or towns, for the reception of gas and water pipes and telegraph wires.

Dated October 7, 1858.

2226. D. Nicoll, of Regent-st. Improvements in the manufacture of cloaks and other garments, and for their application to purposes to which they have not hitherto been applied.

2227. C. H. Thurnham, of Dalston, gentleman. Improvements in the construction and application of certain mechanical arrangements to be adapted to the wheels of locomotives, carriages, and other vehicles for facilitating their traction or draught.

2228. E. J. Seyd, merchant, and J. W. N. Brewer, chemist, of London. An improvement in the preparation of paper to render writing thereon indelible.

2229. J. C. Nouveau, of Paris. Improvements in stopping or stoppering bottles and other vessels containing non-gaseous liquids.

2230. D. Naylor, of Stockport, carpet manufacturer. Improvements in looms for weaving carpets and other fabrics, and in the methods of manufacturing the same.

2231. N. Fellows, jun., of West Derby, Lancaster. Improvements in tea kettles and other like domestic vessels.

2232. F. Ransome, of Ipswich, civil engineer. Improvements in preserving wood.

2233. E. R. Handcock, of Pall Mall. Certain improvements in machinery applicable to engines to be worked by steam and other motive power.

Dated October 8, 1858.

2234. J. Luis, of Welbeck-st. A new cutting and stamping press. A communication.

2235. J. Leetch, of Margaret-st., Cavendish-sq., gun maker. An improved method of constructing fire-arms.

2237. T. Waller, of Ratcliff, engineer. Improvements in stoves and fire-places for the prevention of smoke and the better ventilation of apartments.

2238. J. Mitchell, worsted spinner, H. Mitchell, manager, and T. England, mechanic, all of Bradford, York. Improvements in means, machinery, or apparatus employed in spinning wool, mohair, alpaca, silk, and other fibrous substances.

2239. R. Searle, of Woodford Wells, gentleman. Improvements in insulating and preserving and laying submarine and other telegraphic wires or cables.

2240. A. Nicholls, of Manchester, merchant, and T. Walker, of Birmingham, clerk. An improved spring-hook, catch, or fastening.

2241. W. A. Munn, of Feversham, Kent, Deputy-Lieut. Improvements in horse-hoes.

2242. T. Roberts and J. Dale, of Manchester, manufacturing chemists. An improved process for obtaining salts of soda and other alkalies.

2243. C. W. Lancaster, of New Bond-st., gun maker. A metal or metallic alloy especially adapted to the manufacture of fire-arms and ordnance.

2244. A. Felton, of Spitalfields, currier. Improvements in instruments used for inserting and fixing metal eyelets.

2245. J. T. Smith, of Gray's-inn. Improvements in electric cables.

2246. E. Birchley, of Worcester, attorney's clerk. An improved construction of cartridge.

2247. F. W. Gerhard, of Titchborne-st., Haymarket, mineral surveyor. Improvements in the manufacture of aluminium and sodium.

Dated October 9, 1858.

2248. A. E. Galliard, of Clerkenwell. Making self-supplying portable fountains to play water or water perfumed.

2250. J. Tatlock, of Hookersbrook, near Chester, gentleman. Improvements in electric telegraphs, and in telegraphic cables or conductors for the conducting of electricity in submarine and underground telegraphs.

2251. L. Hope, of Bishopsgate-churchyard, merchant. Improvements in electric telegraph cables. A communication.

2252. W. Crofts, of Nottingham, manufacturer. Improvements in the manufacture of fabrics by bobbin-net or twist-lace machinery.

2253. J. B. Pascoe and J. R. Thomas, of Chacewater, Cornwall. Improvements in condensing and gassing smoke, which are applicable also to forcing and drawing water, propelling ships, and drawing and forcing air to be worked with animal, water, steam, or air power.

2254. J. Scrimshaw, of Sheffield, asphalte-road maker. Improvements in pumps.

Dated October 11, 1858.

2255. A. Miller, of Glasgow, engineer. Improvements in locomotive steam engines. A communication.

2256. J. Holroyd, of Leeds, cloth dresser. An improvement in the knives used for shearing woollen cloths, and cloths made of wool and other materials.

2257. C. F. Vasserot, of Essex-st., Strand. Improvements in constructing reflectors. A communication from A. M. Balencie.

2259. J. Beattie, of South Lambeth, engineer. Improvements in locomotive and other steam engines.

2261. J. L. and F. L. Hancock, of Pentonville, manufacturers. Improvements in implements for tilling, breaking up, or pulverising land, for sowing seeds, and for thinning out turnips and other crops.

2262. J. England, of Charlotte-st., Fitzroy-sq., photographic apparatus maker. Improvements in

apparatus for cleaning the plates used in photography.

2265. J. Platt, of Audlem, Chester, gentleman. Improvements in locks.

2261. J. Nicholson, jun., of Sheffield, steel manufacturer. Improvements in machinery for cutting and winding strips or shreds of steel, silver, or other metal used for ladies' dresses, measuring-tapes, and other purposes, in which the use of strips or shreds of metal are required.

2266. T. Riddell, of Old Ford, gentleman. An improved arrangement for sustaining window sashes and sliding pannels.

2267. M. Stow, of Leeds, merchant. Preventing or securing the detection of alterations or erasures in banker's cheques and other similar instruments, and the crossings thereof.

2268. W. E. Newton, of Chancery-lane. Improved apparatus for facilitating submarine explorations. A communication.

Dated October 12, 1858.

2272. W. Johnston, merchant, and W. Ross, brassfounder, of Glasgow. Improvements in water-closets and taps or valves.

2274. G. Beadon, of Bathpool, Somerset, Captain R.N. Improvements in the construction of ships, boats, rafts, and vessels for passing through water, or through the atmosphere, or partly through the water and partly through the atmosphere.

2276. H. W. and G. Cuthbertson, of Monkwearmouth, Durham. Improvements in lever purchases for ships' windlasses, pumps, and other similar purposes.

NOTICES OF INTENTION TO PROCEED.

(From the "London Gazette," October 26th, 1858.)

1342. H. J. Daniell. "Cancelling cheques."
1344. G. Neall. "Gas stoves, saucepans," &c.
1348. C. C. J. Guffroy. "Consuming smoke."
1351. G. Adshead. "Steam boilers."
1353. W. P. Wilkins. "Refrigerating apparatus."
1354. Sir F. C. Knowles. "Steel."
1363. J. J. Cregeen. "Treating fibres."
1364. J. H. Dickson. "Scutching, hackling flax," &c.
1375. S. and D. Taylor. "Putting belts on pulleys."
1376. C. Crockford. "Treating zinc ores; spelter making."
1381. P. B. E. Martin. "Motive power."
1382. F. G. Spilsbury. "Tungstic acid."
1383. S. Hewitt. "Fabrics."
1392. Sir J. C. Anderson. "Locomotion."
1393. H. H. Henson. "Waterproofing ropes," &c.
1409. J. A. Rainé. "Bedsteads," &c.
1411. P. Brown and B. Young. "White lead."
1417. P. J. Livsey and F. L. Stott. "Warping yarns."
1418. W. and J. Clibran. "Gas."
1422. W. E. Newton. "Centrifugal governors." A communication.
1449. W. H. Preece and J. L. Clark. "Electric telegraphs."
1450. C. Erhard. "Boring wells." A communication.
1459. W. E. Newton. "Printing presses." A communication.
1460. B. Young and P. Brown. "Sewage."
1469. P. P. C. Barrat and J. B. Barrat. "Digging, reaping, mowing," &c.
1477. W. Clark. "Gridirons." A communication.
1495. F. Richmond and H. Chandler. "Cutting hay," &c.
1541. R. G. C. Fane. "Treating sewage."
1628. W. Herapath. "Treating paper to prevent forgery."
1643. E. Hardon. "Woven fabric."
1818. A. Barchou. "Boots and shoes." A communication.
1964. G. Jones. "Slate ridge roll."
2050. J. L. Chester. "Fire-arms." Partly a communication.
2053. J. P. Koenig. "Surgical instrument."
2076. R. Frost and A. Rigg. "Cleaning grain."
2117. T. Cook. "Cheques."
2133. L. Castelain. "Vegetable fibre."
2144. E. T. Wright. "Steam boilers."
2182. G. Uhlhorn. "Motive power."
2196. B. Samuelson. "Wheels."
2200. S. Stimpson. "Fire lighter."
2210. M. Henry. "Working steam expansively." A communication.
2228. W. Malam. "Gas."
2255. A. Miller. "Steam engines." A communication.

The full Titles of the Patents in the above List can be ascertained by referring back to their numbers in the Lists of Provisional Protections previously published.

Opposition can be entered to the granting of a Patent to any of the parties in the above List who have given notice of their intention to proceed, within twenty-one days from the date of the Gazette in which the notice appears, by leaving at the Commissioners' office particulars in writing of the objection to the application.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

2342. W. Tatham.
2343. W. A. Gilbee.
2353. N. S. Dodge.
2372. W. Shears.
2375. J. Smith.
2377. J. Rives.
2385. E. H. Rascol.
2392. T. B. Sharp and R. Furnival.
2399. S. O'Regan.
2404. J. Hands.
2410. J. Whitworth.
2414. W. Hartley.
2484. T. Thomas, jun.

LIST OF SEALED PATENTS.

Sealed October 26th, 1858.

917. W. Jones.
920. J. Seaman.
921. W. Foster.
922. E. E. Lee.
928. C. F. Vasserot.
932. B. Drukker.
938. D. E. Hughes.
943. B. Martin and C. J. Light.
949. A. Winkler.
954. A. M. Perkins.
955. C. Lawrence.
957. W. Smith.
958. W. Smith.
968. G. H. Ellis.
975. R. Wardell.
981. J. A. Hartmann.
985. J. Taylor.
995. W. Ross.
1002. D. E. Hughes.
1023. J. M. Duvard.
1044. J. M. E. Masson.
1050. G. H. Creswell.
1101. H. Curzon, jun.
1130. J. C. Brant.
1169. G. Alton and J. Fernie.
1190. J. Schofield and G. Harling.
1295. A. Rigg, sen., and A. Rigg, jun.
1547. J. Broadley.
1632. J. Chadwick.
1816. W. Spence.
1834. G. Houghton.
1861. C. O'Neill.
1898. W. Clay and E. L. Benson.
1906. C. De Jongh.
1914. A. Boyle.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions.

LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

Dates of Registration.	Nos. in the Register.	Proprietors' Names.	Addresses.	Subjects of Design.
Sept. 22	4120	C. Rowley and Co.	Birmingham	Buckle.
Oct. 7	4121	J. Bremner	Kensington	Shirt.
9	4122	T. R. Barlow	Southwark	Uniform Front.
14	4123	I. McLintock	Barnsley	Stay Fastener.
15	4124	Lovell and Wilson	Fleet-street	Inkstand.
,,	4125	I. Cramb	Dundee	Stereoscope.
20	4126	Easterbrook and Allcard	Sheffield	Bench Vice.
21	4127	H. E. B. Farmer	Northampton	Sprig.
25	4128	C. Brown	Leicester	Washing Board.

PROVISIONAL REGISTRATIONS.

Sept. 23	1017	D. Jones	Birmingham	Cinder Sifter.
,,	1018	W. Northern	Vauxhall	Lock Joint.
25	1019	I. Caddick	Birmingham	Candlestick.
Oct. 4	1020	T. R. Barlow	Southwark	Uniform Front.

NOTICES TO CORRESPONDENTS.

Articles and Correspondence designed for insertion in the ensuing Numbers of the *Mechanics' Magazine* must reach the Office by the Tuesday of each week, at the latest. It is highly desirable that they should be forwarded earlier if possible.

We have several letters and other communications in hand—some of them in type—for which we cannot this week find space.

CONTENTS OF THIS NUMBER.

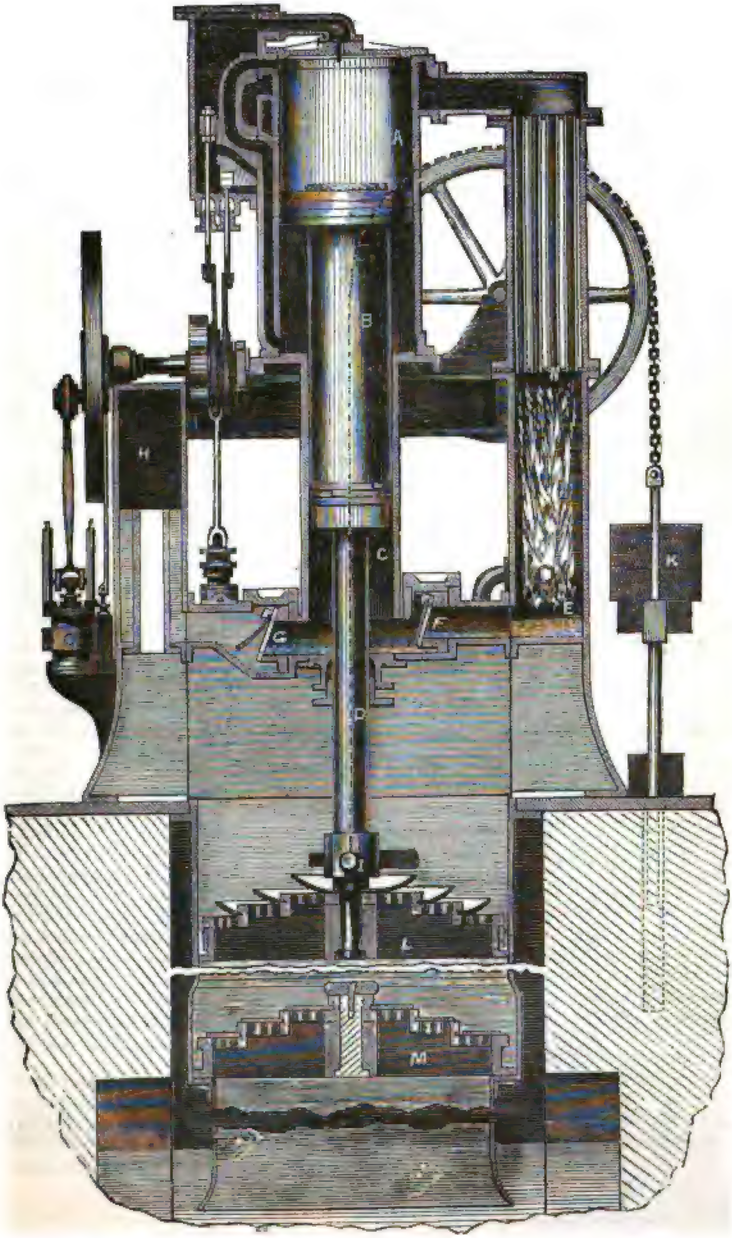
LONDON: Printed and Published by Richard Archibald Brooman, of 166, Fleet-street, in the City of London. Sold by A. and W. Galignani, Rue Vivienne, Paris; Hodges and Smith, Dublin; W. C. Campbell and Co., Hamburgh.

Mechanics' Magazine.

No. 1839.] SATURDAY, NOVEMBER 6, 1858. [PRICE 3D.

Edited by R. A. Brooman and E. J. Reed, 166, Fleet-street, London, E.C.

CARRETT AND MARSHALL'S IMPROVED STEAM PUMPS AND WATER LIFTS.



CARRETT AND MARSHALL'S IMPROVED STEAM PUMPS AND WATER LIFTS.

BY W. E. CARRETT, ESQ., ENGINEER.*

(*Concluded from page* 411.)

We will next proceed to call your attention as concisely as possible to another arrangement of water-lift steam pump in which the water is not enclosed in pipes, and there is no rotatory medium in the shape of a fly-wheel employed. This engine was lately constructed by us, and erected in Holland for surface drainage to work at 5 to 15 strokes, and to raise 7,000 gallons per minute. It is represented in the fig. on the preceding page.

The steam cylinder is 2·5 feet in diameter, and the pump 5 feet. Now, if the cylinder here represented were of ordinary single-action construction, receiving the steam underneath the piston, and then discharging it into the atmosphere, thus effecting the up stroke by mere high pressure, the arrangement would be one of pretty general use for colliery purposes, where cost of fuel is unimportant. But the engine here under consideration is designed to work with greater economy than can be obtained from high-pressure steam, only partly expanded, and afterwards throttled out into the atmosphere. The cylinder, A, is fitted with a piston in the usual manner; but underneath, and attached to this piston, is a trunk, B, turned up and passing through the bottom of the cylinder, and working steam-tight inside another cylinder, C, which, in this case, becomes the air pump. From the bottom of this air pump a further prolongation of the rod, D, communicates motion to the bucket of the pump (which in some cases would be substituted by a ram). Hence, from this disposition of parts, the effective area on the under side of piston, on which the steam is first admitted from the boiler, is annular, while the upper side of such piston has the full area exposed. The position of parts shown is such as when the pump is about to make an up stroke. E is the condenser; F and G the valves of the air pump, H the hot well, I a cross head on the piston rod from which two chains pass over the wheels, J, to the balance weights, K; L is the pump bucket, and M the bottom valve of the same. Steam first enters from the boiler at full pressure (say 50 lbs.) beneath the annular portion of the piston, and at the same time the vacuum operates on the upper or full area. But the high-pressure steam has now only effected half its duty by this up stroke, and is in an unfit state to be discharged into the condenser, not having parted with sufficient of its expansive power. Hence the necessity to re-admit it on the upper or full area side of piston, when it is further expanded down to the atmospheric pressure, or as much below as may be deemed advisable. Thus is effected in one cylinder what in the compound engine requires two, while a ready form of direct-action air pump is furnished without the necessity of applying a beam or radius bar. The remaining power developed by this partially expanded high-pressure steam on its second admission into the steam cylinder, and final expansion, is absorbed in raising the balance weights as well as by the resistance of the water to the buckets' descent. An adjustment of these weights regulates the speed of the down stroke, and the period of rest at its termination. The slide valve is a simple modification of an every-day appliance, with an additional slide on the back, and an adjustable eccentric to regulate the period of admission. This valve is driven by a small auxiliary engine, which at the same time actuates the pump for boilers, thus avoiding the necessity of the tappet and cataract arrangement of the Cornish engines, and affording additional means to feed the boilers when the large engine is at rest. As the exhaust steam leaves the cylinder it passes through a multitubular chamber, N, in its way to the condenser. Around these tubes the feed water from this boiler pump circulates. There it takes up a considerable temperature over and above that of the hot well from whence it was pumped, and thereby enters the boilers at a temperature close upon boiling point. The lift pump is of simple form, which in this case is all that is necessary to act upon a great amount of surface water. The circumference of the bucket has six arms, terminating in a central boss. Upon this rim, and supported by these arms, are three annular cast-iron perforated plates, and upon these are vulcanized india-rubber rings of similar form. Each ring rises a step above the one beneath it, affording a free delivery to the water, the whole being held down by the cotter which attaches the piston rod to the central boss. The bottom clack is similarly constructed, and a man-hole in the pump affords access thereto.

The space above the top of the pump is enclosed, to confine the discharge water to its destined course, terminating upwards at the required height of delivery. In the outlet water-course there are sluice-boards by which the outwater can be kept back, if entrance

* British Association, 1858.

is required to the interior of the pump. As height of delivery and depth of suction vary according to the state of the rams, the pump when working at its lowest head is merely a "lift pump;" but, when the height of discharge increases, it then acts as a "lift and force pump," and requires but a simple adjustment of the balance weights and expansion slide to suit the altered resistance.

In the ordinary dash-wheel engine for land drainage the outwater is often so high as to impair the effective action of the wheel, and when the "inlet" is unusually low the slip is very serious. The improved pump arrangement prevents this, and works advantageously at all variations in water level.

There would be no difficulty in constructing one of these water lifts of 10 feet diameter, discharging fivefold this amount, or in applying a pair working alternate strokes, in which each would balance the other; or either could be worked singly, as above described.

A few words might not have been out of place as to the comparative merits of the centrifugal pump, and its per cent. of duty as compared with the best form of bucket or ram pumps. A passing query shall suffice. Supposing two of the best arranged machines for raising water to be fixed working in competition; one a lift pump or a force pump, or a lift and force pump (their results being about the same); its opponent shall be the best centrifugal pump. The water is to be raised over a stand column which shall be 20 feet or more; and the power for each to deliver full duty, say that of 20 horse. Apply 5 horse power to each, and water will rise a consequent height in the stand column. Increase it to 10 and 15 horse, it will rise higher; but here their respective characteristics come into play. If no additional power is given, the lift pump will be brought to a stand by the balance of forces, and no more power can expend itself; but the centrifugal pump will go on *ad libitum* without discharge. Add another 5 horse power to each, and the lift pump will then undoubtedly deliver its 20 horse power of duty (less friction and leakage); but in some minds there may arise a query—does the centrifugal pump produce alike its total 20 horse power results?

In conclusion, the subject of our illustrations claims no merit beyond the adaptation of uncomplicated parts to the end in view. If it has been thought worthy of attention, my purpose is attained; the "direct-action system" is working its way simply and quietly, and needs no defence; while its reduction of first cost is, perhaps, the most powerful inducement to its adoption.

ENLARGEMENT AND IMPROVEMENT OF THE "MECHANICS' MAGAZINE."

THE "MECHANICS' MAGAZINE" has now existed for thirty-five years in its present form, and during that long period its value has been repeatedly attested by men of every class—from Lord Brougham, who was one of its earliest eulogists, down to the humblest artizans in the kingdom. The many thousands who have constantly read it know perfectly well that it has borne a conspicuous, and even a proud, part in the promotion of those great undertakings by which practical science has distinguished the last half-century—the construction of railways, the extension of steam navigation, the development of the electric telegraph, and other kindred works. It is not, therefore, without cause that it has been honoured with a much warmer and far more constant support than any other publications of a like nature—many of which have lately made a transient appearance. But the growth of mechanical science has become so great that the demands upon the Magazine are now found to exceed its limits, and we have therefore resolved to give it a much enlarged and entirely new form, adapted to the circumstances of the present age—to make it, in fact, a first-class scientific newspaper, well edited, carefully illustrated, and in every respect worthy of the great objects to the furtherance of which it is devoted. We are determined to spare no needful expense in producing it, and intend to avail ourselves of all those sources of information which our long experience has opened to us, and in the very centre and focus of which our professional calling happily places us.

The publication in its new character will receive the extended title of "THE MECHANICS' MAGAZINE; AND JOURNAL OF ENGINEERING, AGRICULTURAL MACHINERY, MANUFACTURES, AND SHIPBUILDING," and our aim will be to give it a definite and special value in each of those branches of mechanical science which its title indicates. The reputation of the Magazine as an *engineering* journal is made already, but we hope to considerably extend and consolidate it. The time for great improvements in *agricultural machinery* has manifestly arrived, and our desire will be to lay before agriculturalists full detailed descriptions of all really valuable implements as they are from time to time introduced, so that farmers and others may find in our pages exact and reliable accounts of those improvements which journalists are usually content to gossip about. Of much that relates to new and improved *manufactures* we firmly hope to be the heralds. In connection with *ship-building*—an art which, except in our own pages, has been much neglected—we confidently assume the foremost place, and have made arrangements for presenting our readers with a series of sound original articles upon the subject, and with regular intelligence of its progress. In addition to the foregoing, we shall publish reports of the proceedings of scientific societies, and such other information as may properly belong to a scientific newspaper. The splendid part played by inventors of every class in this country, under the protection of the Patent Laws, will also be duly regarded in our columns, in which complete lists and descriptions of all patents applied for, granted, and extended, will continue to be recorded from week to week, together with lists of all articles protected under the Designs' Acts. No pains will be spared to render this part of our Magazine as full and reliable, if possible, as the official Government records themselves. We have before guarded, and hope still to guard, the privileges of inventors against both open and covert attacks; and every inventor may, if he please, find in our pages a channel for every reasonable complaint and every sensible suggestion.

The first Number of the New Series of the Magazine will be published on the 31st of December, when the price will be made 4d. (by post, 5d.), but this increase in price will bear no considerable proportion to the improvements which will be introduced. We confidently hope, not only to retain the whole of our present subscribers, but to insure their good offices in greatly extending our circulation. We hereby beg to request their aid in this respect. As our Advertisement department will be greatly augmented, we shall also be happy to receive the support of our present readers in that respect also.

ON THE COLLAPSE OF GLASS GLOBES AND CYLINDERS.

BY W. FAIRBAIRN, ESQ., F.R.S.*

AT the meeting of the British Association last year a paper was read upon the collapse of cylindrical wrought-iron riveted tubes by a uniform external force. These experiments upon a ductile and fibrous material led to some novel and important results, and suggested the propriety of similarly testing the resisting powers of a perfectly homogeneous crystalline and rigid material, in order that our knowledge of the laws which govern the resistance of vessels to collapse might be confirmed and extended.

For this purpose glass was the material selected, not only on account of its fulfilling better than almost any other material the conditions sought for, and from the ease with which it could be manufactured into the required forms, but also because it was hoped that the results would be practically of value in those cases in the arts and in experimental science in which it is so extensively employed.

The experiments were conducted in a similar manner to those upon iron. Some glass cylinders and globes were procured

* British Association, 1858.

direct from the glass-house, blown out of good flint glass. The open ends of these were then hermetically sealed by the blow-pipe, and they were placed in a strong wrought-iron vessel capable of sustaining a pressure of 2,000 lbs. per square inch. Water was then pumped in by means of a force pump, and the pressure was recorded by a Schaeffer gauge. The point of rupture was indicated by an explosion within the vessel, and by the sudden decrease of pressure.

The first experiments were upon glass globes intended to be perfectly spherical, but in most instances somewhat flattened upon the side opposite to that from which they were blown. Notwithstanding, however, this ellipticity, some of the globes bore enormously high pressures, especially when the extreme tenuity of the glass is considered, amounting to only from one to two hundredths of an inch in thickness.

TABLE I.

Strength of Glass Globes to resist an External Pressure.

Mark.	Diameters.		Thickness.	Collapsing Pressure.
	ins.	ins.	ins.	lbs. per square in.
L	5·05	4·76	0·015	292
M	5·08	4·70	0·019	410
K	4·95	4·72	0·021	470
B	5·60	—	0·020	475
N	8·22	7·45	0·010	35
C	8·20	7·30	0·012	42
D	8·20	7·40	0·015	60

It will be seen that, notwithstanding the extreme thinness of the glass, the pressures range as high as 475 lbs. per square inch over every square inch of surface, equivalent to a total pressure of 20 tons upon a 5½-in. globe $\frac{1}{50}$-in. thick before it was fractured.

Unfortunately the 8-in. globes were all elliptical to a serious extent, and hence in these the collapsing pressure was greatly reduced, ranging from 35 lbs. to 60 lbs. per square inch only.

The next results are upon glass cylinders blown with hemispherical ends. In the experiments upon iron the remarkable law had been deduced that the strength of cylindrical vessels of that material, exposed to a uniform external pressure, varied inversely as the length. Thus, with vessels precisely similar in other respects, one twice the length of another bore only half the pressure; one three times the length bore only one-third of the pressure, and so on. From the following experiments it will be seen that a similar law applies in the case of homogeneous glass cylinders.

TABLE II.

Strength of Glass Cylinders to resist a Uniform External Pressure.

Mark.	Diameter.	Length.	Thickness.	Collapsing Pressure.
	ins.	ins.	ins.	lbs. per square in.
E	4·06	18¼	0·045	180
G	4·02	14	0·065	297
H	3·98	14	0·076	382
P	4·05	7	0·046	380
O	4·05	7	0·034	202
T	3·09	14	0·024	85
R	3·08	14	0·032	103
S	3·25	14	0·042	175

These cylinders, though of high resisting powers, sustain considerably less pressure than the globes. Comparing cylinders E and P, 14 in. and 7 in. long respectively, and of the same diameter and thickness of glass, we find the longer was crushed with about half the pressure which was requisite to collapse the shorter cylinder, which is a confirmation of the law deduced from iron tubes.

The general formula for the globes takes the form of the following equation:—

$$P = \frac{C \times t^{\frac{3}{2}}}{D^{3 \cdot 17}},$$

P being the collapsing pressure in pounds per square inch, D = diameter, t = thickness of glass. Similarly, putting L = length, the formula for the cylinder is—

$$P = \frac{C \times t^{\frac{3}{2}}}{D \times L}$$

—which is precisely similar to that for iron tubes.

PROFESSOR RANKINE ON PRACTICAL SCIENCE.*

(*Concluded from p.* 416.)

ENGLISH AND AMERICAN RAILWAYS.

As regards railway carriages, the tendency of the present day is to increase their length and capacity, in imitation of those used in America. Those large carriages are cheap and convenient; but it is worth consideration whether their length and weight do not increase the danger to passengers in the event of a collision—their weight, as increasing the momentum of each separate carriage; and their length, as diminishing the compressibility which the

* British Association, 1858.

train derives from the buffer springs. Much remains still to be done towards increasing the comfort of railway carriages. The interesting work of Mr. Colburn and Mr. Holley on European railways has furnished abundant evidence of the fact that the light and cheap mode of construction which is common in America, and which, from motives of economy in first cost, has been of late partially introduced into this country, not only fails to produce any real economy, but is absolutely ruinous in working expenses. The manufacture of locomotive engines is making great progress, through improvements in rapidity and exactness of workmanship. The peculiarities of the American locomotives, which were last Session very fully explained to us by Mr. Neilson, are attracting attention in this country, from the good adaptation of those engines to steep gradients and sharp curves.

COAL-BURNING LOCOMOTIVES.

The use of coal instead of coke as fuel for locomotives is rapidly spreading, with most beneficial results. The advantage of coal over coke in point of cheapness is so well known as to need no comment; and many members of this Institution must have had occasion to observe the great superiority of coal over coke in raising and maintaining a high pressure of steam; the effect of which is, that the same engine which, with coal as fuel, can be worked expansively, so as to economize the heat to the best advantage, requires, when coke is used, to be worked at full pressure; so that, even independently of the high price of coke, the steam works less economically. Several forms of locomotive fire-box, specially adapted for burning coal, have lately been invented. I have seen it burned in the ordinary fire-box without the production of any smoke whatsoever, the coal gas being entirely consumed before the flame entered the tubes; but this required careful adjustment of the opening of the fire-door on the part of the engine-driver and stoker, so as to admit just enough of air above the fuel and no more. The prevention of smoke, besides its great natural importance, has of late acquired considerable artificial importance by having been made the subject of a law. It is well known that the prevention of smoke is accomplished by producing a complete combustion of all the constituents of the fuel; that, if this is done without admitting more air into the furnace than is necessary for complete combustion, it promotes economy of fuel; and that there are a great number of inventions, patented and unpatented, any one of which will accomplish that object if properly managed. The fundamental principle of all the successful inventions for preventing smoke is the same, viz.:—to introduce enough of air above the fuel to burn the coal gas, and enough of air below to burn the fixed carbon, or coke. The number of these inventions has become so great that I cannot attempt to enumerate or arrange them; but it may be interesting to the members of this Institution to hear, that one of the most convenient and useful of these contrivances, the introduction of air through tubes perforated with small holes, near and behind the bridge, was successfully used forty years ago at Govan, by Mr. Morris Pollok. The most perfect example of the prevention of smoke which I have lately seen is at some reverberatory furnaces into which blasts of air are blown by a fan both above and below the fuel.

THE CONTROL OF PRACTICAL SCIENCE BY LAW.

In the administration of the law for the prevention of smoke, the thing chiefly to be avoided is the giving a preference to some particular method of prevention, and the enforcing it in all cases, without considering whether it is suitable to each particular case. Every furnace owner ought to be left as far as possible to adopt that contrivance which appears to his own judgment to be the most convenient and suitable. The same principle is true with respect to the application of the law to all branches of practical mechanics. Let every engineer, every manufacturer, every shipowner, every person who makes or uses anything which can cause nuisance, damage, or danger to others, be fully responsible for all the nuisance, damage, or danger that his structures or machines may occasion; but let the means of preventing those evils be left to his own judgment. Any other course lessens his feeling of responsibility, and tends not only to retard the progress of improvement, but to produce the very evils which it is designed to prevent; and such is the effect of all regulation by authority of such matters as the thickness of a boiler, the thickness of the plates of a ship, or the closeness of her ribs. Nothing can tend more effectually to prevent the vexatious interference of the Legislature with engineers and manufacturers than the belief on the part of the nation that the engineers and manufacturers are willing and ready to exert themselves, in order to render their works free from annoyance and danger to the public. That belief ought to be strengthened, and I have no doubt is strengthened, by the fact of the existence of such voluntary associations for promoting safety and economy in the use of steam as that which has for three years been suc-

cessfully in operation in and near Manchester, and that which is now being founded in Glasgow. Independently of their advantages in promoting safety, such associations are of most essential service to engineers, by collecting, recording, and arranging facts as to the efficiency and economy of furnaces and engines; which facts, in their isolated condition, are of little or no value, but, being collected and arranged, lead to useful practical and scientific conclusions.

THE STRENGTH OF BOILERS.

A contribution of almost unequalled importance has lately been made to our knowledge of the laws of the strength of boilers by Mr. Fairbairn's experiments on the resistance of thin tubes to collapse. In my introductory address last year, I referred to a preliminary report on those experiments which had been read to the British Association in Dublin. Since the close of our last session, the detailed account of those experiments has been laid before the Royal Society, and will probably be published in the Philosophical Transactions for 1858; and an abstract of their results has been read to the British Association. Mr. Fairbairn finds that the intensity of the pressure required to make a flue or other thin tube collapse is directly as the square of the thickness nearly, inversely as the diameter, and inversely as the length. The diminution of the strength of a flue, as the length increases, is a law never before suspected. For computing the pressure in pounds on the square inch which a wrought-iron flue can sustain, the following rule is sufficiently near the truth for practical purposes:—*Multiply the constant factor*, 806,000, *by the square of the thickness, in inches, and divide by the product of the length, in feet, and diameter, in inches.* It is of great importance to strength that the flue should be exactly cylindrical; and, as a flue with lapped joints cannot be exactly cylindrical, Mr. Fairbairn recommends that flues should be made with butt-joints and covering-strips. Upon applying the law thus discovered to the internal flues of existing boilers, it appears that they are almost all too weak, being in general only one-third of the strength of the outer shell, instead of being equally strong, as they ought to be. This explains much of the mystery which formerly hung over the cause of steam-boiler explosions. So far from the number of such explosions being a matter for wonder, the marvel is, that any boilers with internal flues have escaped. As a remedy for that weakness Mr. Fairbairn proposes to strengthen long flues at intervals by means of hoops or rings of T-iron, his experiments having proved that a long flue so hooped is as strong as a shorter flue whose length is equal to the distance between two adjacent rings. This strengthening of flues by means of rings is not absolutely new in practice; but the principles on which it depends, and the rules according to which it ought to be executed are undoubtedly the discovery of Mr. Fairbairn.

LIMITATION OF MR. FAIRBAIRN'S FORMULA.

I may now call your attention to an obvious limitation of the exactness of Mr. Fairbairn's formula. It cannot be true that by indefinitely lengthening a tube its resistance to collapse is indefinitely diminished; neither can it be true, that by indefinitely shortening a tube its resistance to collapse is indefinitely increased. Mr. Fairbairn's formula, therefore, cannot be applicable to tubes which are either very long or very short, as compared with their thickness; although, for such intermediate lengths as occur in boiler flues, it is sensibly quite accurate.

STRENGTH OF BEAMS.

Another important experimental inquiry into the laws of the strength of materials is that of Mr. William Henry Barlow, on the resistance of beams to breaking across. I mentioned in my introductory address last year the general nature of the result of Mr. Barlow's first series of experiments; and I have now only to state, that his second series of experiments on the same subject has appeared in the Philosophical Transactions for 1857. In the same volume also is contained an important series of experiments by Mr. Hodgkinson, on the strength of pillars. Important progress has of late been made, in the adoption by practical men of correct principles as to the action of the particles of a beam in resisting fracture; the knowledge of which principles had formerly been confined to a few mathematicians. They relate chiefly to the action of the *shearing force*, and its combination with that of the *bending force*, which latter was at one time the only circumstance considered. One of their results is, that the *neutral axis* of a beam, as it is called, is not, as it used to be described, a place of no strain whatsoever on the particles; but is truly a place where, although the strain in a horizontal direction due to the bending force is nothing, the strain due to the shearing force is a maximum, and consists in a tension in one diagonal direction and a compression in another, each making an angle of forty-five degrees with the horizon. Mr. Stephenson lately, while referring to this fact, proposed

a very ingenious method of verifying it experimentally. On the side of an unloaded beam, a series of small circles are to be drawn. When the beam is loaded, each of those circles will become an ellipse, whose dimensions are to be measured. It will be found that near the upper side of the beam each ellipse has its longer axis vertical and its shorter axis horizontal; that near the lower side, each ellipse has its shorter axis vertical and its longer axis horizontal; that at the neutral axis, each ellipse has its longer and shorter axes sloping at angles of forty-five degrees, and that ellipses in intermediate positions have intermediate figures and obliquities.

IRON BRIDGES.

The construction of iron bridges of great size still continues to be one of the leading features of the engineering of the time. The forms of bridge which have been practically tested may be divided into five classes—the arch, the suspension bridge, the tubular girder, the lattice girder, and the bowstring girder; of each of which I shall cite one recent example:—The arch, exemplified by Mr. Page's Westminster bridge, which has the broadest roadway in the world; the suspension bridge, by the bridge of the same engineer at Chelsea; the tubular girder, by Mr. Stephenson's enormous viaduct across the St. Lawrence, at Montreal; the lattice girder, exemplified in the form invented by Captain Warren, by the Crumlin viaduct, which, constructed by Messrs. Liddell and Gordon as engineers, and Mr. Kennard as contractor, crosses the vale of the Taff at the height of two hundred and twenty feet; and the bowstring girder, exemplified, in a novel and singular form, and on a gigantic scale, by Mr. Brunel's viaduct at Saltash, in which the string of the bow, which in the original form of the bowstring girder was a straight tie, is made to take a curved or rather a polygonal form, and to act as a suspension chain. The great works which I have cited as recent examples of viaducts are interesting in other respects besides the superstructure. The piers of the Crumlin viaduct, which I understand to have been designed by Mr. Kennard, consist of a skeleton framework of iron, being excellently adapted to the purpose of attaining an immense height at a moderate expense. The bases of the piers of the new Westminster bridge may be briefly described as consisting mainly of cast-iron boxes filled with concrete. Those of the Victoria bridge at Montreal are of massive granite masonry, remarkable for the cost which has been incurred in order to enable the piers to withstand the floating ice of the river. The central pier of the Saltash viaduct is founded by a process originally practised at the new Rochester bridge, but never before carried out on so great a scale, consisting in the sinking of vertical iron cylinders filled with compressed air, inside of which the excavators and masons work. The completion of those great structures will furnish important data for settling the question as to the most economic mode of crossing wide valleys at great heights, and of founding heavy structures under difficulties of various kinds. A sixth class of bridge, which I mention apart because it has not yet been practically tested, its probable success having been inferred from theoretical calculations verified by experiments on a reduced scale, is the suspension bridge, adapted to the passage of railway trains by a stiffening framework of strength sufficient to prevent the undulations which would otherwise endanger the structure. This is the design of Mr. P. W. Barlow's bridge at Londonderry, to which I referred in my address last year. Should that bridge answer its purpose of safely carrying trains at considerable speed, it will probably be found to be the cheapest mode of crossing spans which lie between certain limits.

SUSPENDED CANALS.

A very happy adaptation of the suspension bridge is its use to carry canals. When used for that purpose, the suspension bridge requires no stiffening framework, and is subject to no undulations, except such as may be caused by the wind; for, as each boat displaces its own weight of water, the load is always uniformly distributed. This invention of Mr. Roebling has been employed with success in America, but has not yet been introduced into Britain. It is probable that it might be found an easy and cheap method of carrying aqueducts for the supply of towns, or of water-mills, across deep valleys.

GAUGING STREAMS.

In connection with the storing and conveyance of water for such purposes, I shall now refer to an important improvement in the gauging of the flow of streams of water by means of weirs or "notch-boards" which has recently been introduced by Professor James Thomson, of Belfast. Hitherto it has been the practice to gauge such streams by causing them to flow through rectangular notches in vertical boards or weirs, and observing the height at which the still water behind the weir stands above the lower edge of the notch. The mean velocity of the stream of water which falls over that edge in the form of a cascade bears a certain proportion to the velocity

which a heavy body would acquire by falling through the height already mentioned. The sectional area of the same stream is found by multiplying the product of the same height and of the breadth of the notch by a factor called the "coefficient of contraction." The product of the mean velocity of the stream into its sectional area gives the volume of water discharged in a second. A serious imperfection in this method consists in the uncertainty and variability of the "coefficient of contraction," which is different for different heights, and also for every different proportion of the height to the breadth of the notch, and is consequently variable for the same stream flowing through the same notch, when the volume of the flow varies. Its variation has not been reduced to any general law; and the value to be assigned to it in each particular case has to be taken from voluminous tables of experiments by Poncelet and Lesbros. Engineers are consequently often compelled, sometimes by the want of those tables and sometimes by want of time for their use, to employ an approximate average coefficient of contraction, and thus to compute the flow from sources of water in a rough and inaccurate way. This evil obviously arises mainly from the fact, that the section of the stream flowing through a rectangular notch is not a similar figure when the flow is large and when it is small; and Mr. Thomson has therefore adopted a form of notch in which the section of the stream is always of similar figure; that is to say, a triangle with the apex turned downwards. For such a notch, the coefficient of contraction is either constant or very nearly so. Mr. Thomson's experiments, which are made at the expense of the British Association, are not yet complete; but they are sufficiently advanced to have enabled him to publish a formula applicable to cases in which the velocity of the stream in the pond behind the weir is insensible. The great utility of that formula induces me to state it now, though in terms differing a little from those in which Mr. Thomson has expressed it. For the mean velocity of the stream, take eight-fifteenths of the velocity due to the height of fall from the surface of the pond to the apex of the notch. For the area of the contracted stream, take five-eighths of the area of the triangle bounded by the top-water level and the edges of the notch. In other words, the volume of the flow is the area of that triangle multiplied by one-third of the velocity due to the height before mentioned.

HYDRAULIC POWER.

Mr. Thomson's improvement in the measurement of sources of water comes at a good time; for the economic use of these sources is becoming every day of greater importance. The subject of the water-supply of large towns has of late been so fully discussed that I shall not now enlarge upon it, especially as we may, perhaps, hope at a future period to have it before us in a most interesting shape, when the works now in progress for the supply of Glasgow shall be completed. Another important and very ancient use of sources of water is for the obtaining of motive-power; and that is a use which no degree of abundance or cheapness of coal ought to induce us to neglect; for every horse-power obtained on land by the proper application of streams of water sets free a certain quantity of coal to be employed at sea or in locomotive engines. It is well known that when rivers are left in their natural condition, their flow is so irregular, from the alternation of floods and droughts, that a small fraction only, such as a third or a fourth of the whole volume of water which flows down, can be made available for water-power. The remainder, being the surplus water which comes down during floods, usually does much damage, and effects no useful purpose except sweeping away deposits in an uncertain manner and at irregular intervals. The remedy for that evil is the well-known and obvious one of forming store reservoirs in suitable sites on the course of each stream, in order to store up the surplus waters of floods, and to let them down by degrees, so as to increase the ordinary flow available for motive-power and other useful purposes. That remedy has been extensively applied to small streams, such as the Allander and the White Cart in this neighbourhood, the Shaws water near Greenock, and others; but the larger rivers are left nearly, if not altogether, in their natural irregular condition. It was long ago pointed out by Mr. Adam, that the valley of the Clyde, above the Falls, presents a site where a large quantity of water could be stored at a moderate cost, to be used for motive-power and other purposes. A similar scheme was, at a later period, proposed by Mr. Thomas Kyle, for the water-supply of Glasgow; and a few weeks ago, Mr. Hill, of Barlanerk, proposed its revival, with a view more especially to the use which might be made of the water-power so obtained for the removal of sewerage. There can be little doubt that the storing and equalizing, to a certain extent, of the flow of the Clyde might be rendered remunerative; for, if the probable demand for the additional water-power which would be rendered available were first ascertained, the magnitude of the storage works could be adjusted to that demand. With respect

to the sewerage of Glasgow, there is one benefit which would obviously arise from a partial equalizing of the flow of the Clyde, even under the present system of drainage. It appears from the experiments reported by Dr. Anderson and Mr. Bateman, that sewerage which flows into the Clyde at Glasgow, when the river is low, takes a month to reach Dumbarton. Were the flood-waters of the Clyde stored, even to a moderate extent, and let out by degrees, the fresh-water current would never fall to that extreme sluggishness which has been proved by those experiments, and the sewerage could be carried away with a greatly increased velocity.

THE DRAINAGE OF TOWNS.

I have now been led by degrees to the most perplexing problem ever submitted to engineers—that of the drainage of large towns; complicated as it is with chemical, physiological, agricultural, commercial, and social questions; of which almost all that can be said is, that, if much labour and thought have been expended on them, much more are still required. The opinion of many competent judges appears to be, that, if physical circumstances were to be alone considered, the best method for the cleansing of cities would be to remove as much of their refuse as possible in the solid form, combined with dry deodorizing substances; but against that plan there has been urged the objection, in a social point of view, that the change of customs which its adoption would involve is impracticable in Britain. If, then, the refuse of cities is to be removed altogether in the form of liquid sewerage, any means of rendering that sewerage harmless, at a moderate cost, whether it is to be discharged into the sea or into a river, or used for the irrigation of land, must be most valuable. According to the report of Dr. Anderson and Mr. Bateman, such means are afforded by an invention of Dr. Angus Smith and Mr. M'Dougall, consisting in the addition of sulphurous acid and carbonic acid to the liquid sewerage. The use of certain substances distilled from coal for that purpose was some time ago proposed by Mr. John Tennant, manager of St. Rollox Chemical Works. It would be foreign to the province of this institution to enter into chemical questions in detail. The mechanical branch of the subject will probably be soon brought before us again.

WAR MATERIALS.

From sanitary engineering the transition is natural to the art of defence against human enemies, of which we had an example last session in the improved rifle-sight of Mr. Lawrie. It is certain that at present many experiments on that art are in progress in different parts of the world, especially on artillery and the strengthening of ships. The most curious contrivance in the art of war which has recently been published is that of Mr. Macintosh, for suffocating an enemy by the smoke of naphtha and sulphuret of carbon.

HARBOURS AND DOCKS.

In harbour and dock engineering the limited time now remaining only permits me to refer to those excellent examples which exist in our immediate neighbourhood, and to hope that the engineers of those works may be induced to give a description of them to this institution.

SUBMARINE TELEGRAPHS.

The last subject to which I shall refer is that of submarine telegraphs. With respect to the Atlantic telegraph, it must be admitted that, even in the event of its being found impossible to repair the fault in the existing cable, the experiment which has been made will have answered the purpose of proving the practicability of the undertaking, and of furnishing its promoters with that experimental knowledge of its difficulties and dangers which will enable them afterwards to avoid or overcome those obstacles, so as to insure the permanent efficiency of the next cable that shall be laid. The great improvements lately made by Professor Thomson in apparatus for transmitting and receiving electric signals will much facilitate the use of all telegraphic lines of great length; having, in fact, enabled intelligible messages to be sent through the Atlantic Cable when other means had failed. The Red Sea cable will probably be laid with the success which has hitherto attended the operations of Messrs. Newall and Co. There will soon be a submarine telegraph across Bass's Straits, to connect Australia with Tasmania.

Thus far I have endeavoured to fulfil one of the duties of the president of this institution, by giving an outline of the recent progress and present state of some at least of the many branches of the vast subject of engineering and mechanics. In conclusion, I again congratulate the members of this institution on the extent to which it has contributed to that progress, and on the prospect which it enjoys of continuing that good work with success and honour.

THE WARMING OF ST. PAUL'S CATHEDRAL.

The warming of St. Paul's Cathedral, which contains about five millions of cubic feet of air, for the special services about to take place being the greatest undertaking of the kind that has yet been attempted, we are induced to give our readers a short description of the process adopted, so far as it has at present been proceeded with. The work is undertaken by the London Warming and Ventilating Company, 36, Great George-street, Westminster, and is now complete, so far as the nave of the cathedral is concerned, with the exception of a few openings which have to be made in the floor and the temporary iron gratings for the same, which will ultimately give place to brass or gun-metal gratings of suitable patterns. The nave forms nearly one-third of the cathedral, and the warming of it has been perfectly successful. For the purpose of trial it was cut off from the dome by curtains of glazed calico, and the crypt below was also cut off at the same point with sail cloth. The stoves, six in number, constructed according to Mr. Goldsworthy Gurney's patent, are in the crypt, and are found to be far from expensive, and amply sufficient for this portion of the building. When the arrangements are completed the crypt, and of course the whole of the cathedral, will each be thrown into one entire space, the two communicating with each other through the gratings in the floor of the cathedral. These gratings are so arranged that a certain and constant number of them will be up-casts and the remainder down-casts, with the power of turning the whole into up-casts during the time in which large congregations are assembled. At this time a full supply of fresh warm air will be passed up from the crypt, and escape by the upper openings at the top of the dome. The warming is so perfectly effected that during the recent trials, although the heat of the nave was run up to a considerable extent above the mean point, the increase was not more at the roof on the average than at the floor of the nave. Generally the increase was the same, and on no occasion was it more at the roof than two degrees above the floor. This effect is obtained entirely by the peculiar nature of the stove and the convection of heat caused thereby. The stove patented by Mr. Gurney

VERTICAL SECTION.

PLAN.

ELEVATION.

carries out in a simplified form the principles of the apparatus which for five years has been used in warming the Houses of Parliament. It consists of a plain interior cylinder, A, and a series of perpendicular radiating wings, B, B. The stove is placed in a pan of water, C, the water being regulated in depth to produce

to the sewerage of Glasgow, there is one benefit which would obviously arise from a partial equalizing of the flow of the Clyde, even under the present system of drainage. It appears from the experiments reported by Dr. Anderson and Mr. Bateman, that sewerage which flows into the Clyde at Glasgow, when the river is low, takes a month to reach Dumbarton. Were the flood-waters of the Clyde stored, even to a moderate extent, and let out by degree the fresh-water current would never fal' that extreme sluggishness which ha is all proved by those experiments, and th of age could be carried away wit' water from increased velocity. This

THE DRAINAGE O' ...ds. by conduction

wings of the
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physiological the stove. the hygrometer is maintained
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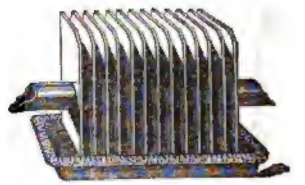
thought And not only is the break maintained, but
more the evaporating process has the advantage
man' of causing a great abstraction of heat
if p' from the stove, consequent upon the contact
co' of vapour with the metal, and the rapid
o current of air induced by the wings of the
stove. This again gives a healthy circulation, and, with the convection, causes the heat to be carried into every portion of the building in which the stove is placed, even in the extreme case of its position being at one end of an oblong room. It is also evident that the rapid abstraction of heat effectually prevents the over-heating of the stove, and the consequent burning of the air. Another point not generally so well understood is the now ascertained fact that air brought into contact with horizontal pipes (whether flue, steam, or hot water) is seriously deteriorated, in consequence of eddies being formed over the top or hottest portion of the pipe. We conceive the main advantages of this stove—and they are very important—to be a rapid abstraction of heat and consequent comparative coolness of the metal of the stove, the saturation of the air with the amount of moisture due to its temperature, the uniform circulation caused by this process partly from the convection of heat and partly from the circulation depending upon the rapid passage of air over the stove, and the ease with which any reasonable amount of fresh air can be introduced. We shall notice the effect produced in St. Paul's during the ensuing winter, and anticipate that it will be very satisfactory.

We must not leave the subject without remarking upon a modification of Mr. Gurney's apparatus patented by Mr. Wood-

present many experi and Secretary of the
in progress in diff d Ventilating Company.
especially on art a steam or hot-water pipe
of ships. The series of transverse wings or
the art of w one solid casting, (as shown below)
lished is cure a rapid transmission of heat to
cating reme edge of each wing. This modi-
and tion secures, in the space of 14 in. by
the full power of 25 ft. of 4-in. pipe, in



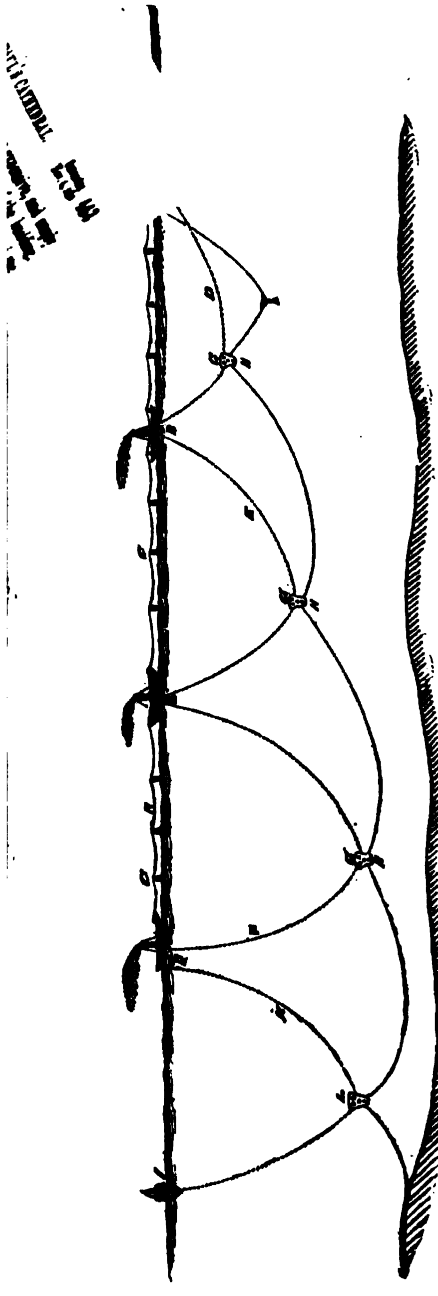
addition to the advantages of circulation, &c., as above described, in consequence of the lower part of these wings resting in water, and the power of producing at will a perfectly-saturated atmosphere by means of a jet of water playing over the apparatus. We conceive that these features must be of the greatest advantage to the horticulturalist, and wherever hot water or steam is used.

Certain arrangements for ventilation, adopted by the same company, we may have to notice on a future occasion.

SCHILLER'S APPARATUS FOR SUBMERGING AND RAISING SUBMARINE TELEGRAPH CABLES.

Mr. H. Carl Schiller, of Kensington, has forwarded to us a description and set of drawings for an apparatus designed for the purpose above stated. "It is obvious," he says, "that, although the late expedition to submerge a deep-sea telegraphic cable was ultimately successful, yet the repeated failures which preceded the success make it desirable to discover means of effecting the object with fewer and diminished chances of such ruinously expensive failures again intervening between the attempt and its final accomplishment. The plan proposed I hope may be found to attain this object. The apparatus is of course gigantic in proportion to the magnitude of the enterprise in question; yet, in addition to the means previously employed, I believe inexpensive, as compared to the results to be hoped for. The apparatus, when once created, may be used for years for similar purposes at the mere cost of repair. I conceive, also, that, by its use, the cable could be made to adapt itself more certainly to the inequalities of the bed of the ocean." The principle upon which his

apparatus is constructed is simply that of dividing into any requisite number of parts the



weight of, and strain upon, the cable while suspended between the ship and the bottom, so as "never to lose control over it from its being paid over the stern of the carrying vessel, until it is finally deposited upon the bed of the ocean,—nor even then, as, by the same apparatus, merely reversed in position, it may be recovered from the sea with equal facility."

The annexed engraving exhibits the general arrangement of the proposed apparatus. The cable-carrying ship, A, is to tow astern a requisite number of other steam ships, B, B, and buoys, C, C, attached to her and to each other by hawsers, R, R (or by chains or other gear). The buoys are designed to sustain the weight of the hawsers. The secondary steamers, B, B, are to carry slings, D, E, F, led from one to the other, so that each ship, except the leading ship, shall sustain two ends of the slings, *i. e.*, one sling between every two steamers, the ends inboard being led over windlasses connected with the steam machinery of each ship, to enable her to shorten or lengthen the sling by paying out or hauling in upon it, with any rapidity circumstances may require. Upon each of the slings, D, E, F, runs a free travelling block, G, carrying a second block, H, containing two pulleys, situated vertically to each other.

The slings are each to be of a proportionally greater length or dip, relative to its distance from the leading ship, to produce the angles requisite for the safe suspension (at intervals) and delivery of the cable at the lowest soundings required. Above the stern of the cable-carrying ship, and at the greatest allowable distance from the paying-out apparatus, is to be suspended from a frame a short sling sustaining a double-armed spring, upon the principle of a coach spring. From the extremities of the arms of the spring are to depend braces carrying a block with pulley, over which the cable is to pass after leaving the paying-out apparatus,—to which, in fact, this spring and pulley are to be considered as an addition. The use of this spring, which is fitted with hinged flanges or vanes, is to obviate the sudden strain, by a jerk, upon the cable, from a heave or lurch of the ship. The flanges should be of a wide spread, somewhat hollow above, and convex on their undersides. Their effect would be, upon any violent heave of the ship, which would necessarily jerk the cable, to produce, by their resistance to the atmosphere, a greater play of the arms of the spring, and thus reduce a sudden jerk to a gradual strain. The cable, represented by the lowest curved dotted line, is to be led from the paying-out apparatus, through the

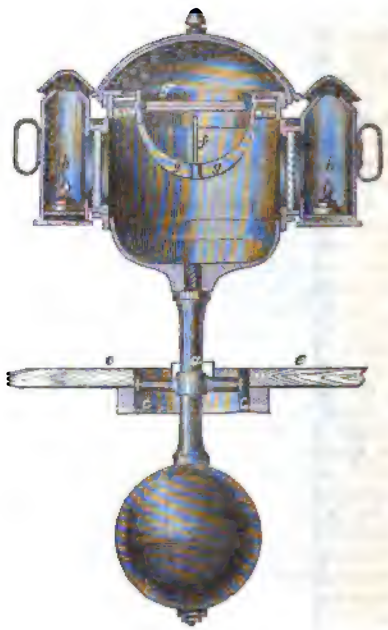
block suspended by the spring and sling, over the stern of the cable-carrying ship, from thence through the blocks upon the slings, D, E, F, successively, being supported by the lower pulley in each, over which it will pass; or rather the pulleys, while supporting the cable, will roll under and leave it (the cable) in their progress forward with the flotilla to which they are attached by the slings. The cable will thus be supported at such intervals as may be calculated to be perfectly safe. It descends by steps (as it were) from sling to sling, which steps may be regulated by the windlasses on board each successive steamer, so as to increase or decrease the aggregate angle to any one required for the safe support of the cable.

Mr. Schiller also describes an indicator "for the immediate discovery (during the process of laying down or of under-running the telegraphic cable) of the shoaling of the bottom or increase of soundings," and adds a description of a modification of his plans, with certain supplementary parts.

We can only repeat what we have often before said, viz., that deep-sea telegraphic cables should be too light and too handy to need any such vast and costly apparatus as Mr. Schiller has contrived. We can show but little countenance to gigantic schemes, until simpler plans, of a much more promising character, have been fairly tested.

BROWN'S IMPROVED SHIPS' BINNACLES.

Mr. G. Gibson Brown, of Wickham-terrace, New-cross, has lately patented the followed improvements in ships' binnacles and compasses, which mainly consist in making the compass card transparent, and lighting it from below. The engraving represents a vertical section of a binnacle and compass. The binnacle is there shown mounted on a spindle which moves on gimbles; but it may, if preferred, be received into a frame, and the frame be arranged to move on gimbles, in order that it may maintain an upright position though the deck of the vessel may incline to one side or the other. *a* is the stem of the binnacle, which is fixed to a bar or axis the ends of which turn freely in bearings, carried by the ring or frame, *c*, which has necks or axes moving freely in the deck, *e*, or in any suitable support placed in the deck. The compass card is made of talc or other suitable transparent material, and, in place of using a basin or hollow vessel to carry the pin or fixed axis, *f*, of the compass card, a simple frame, *g g'*, is used, *g* being a ring, and *g'* a bent bar descending therefrom. This frame is carried by and moves on gimbles, in like manner to the basins of ordinary compasses. *h*, *h* are two lamps applied on either side of the binnacle, and



fluted or corrugated glass is preferred to be used between the lamp and the interior of the binnacle.

INSTITUTION OF CIVIL ENGINEERS.

The Council of the Institution of Civil Engineers have awarded the following premiums:—

1. A Telford medal, to James Atkinson Longridge, M. Inst. C.E., and a Council premium of books, to Charles Henry Brooks, for their paper "On submerging Telegraphic Cables."

2. A Telford medal, to George Robertson, Assoc. Inst. C.E., for his paper, "An Investigation into the Theory and Practice of Hydraulic Mortar."

3. A Telford medal, to James Henderson, Assoc. Inst. C.E., for his paper on the Methods generally employed in Cornwall in dressing Tin and Copper Ores."

4. A Telford medal, to Robert Jacomb Hood, M. Inst. C.E., for his paper "On the Arrangement and Construction of Railway Stations."

5. A Telford medal, to Major-General George Borlase Tremenheere, Assoc. Inst. C.E., for his paper "On Public Works in the Bengal Presidency."

6. A Telford medal, to Alfred Giles, M. Inst. C.E., for his paper "On the Construction of the Southampton Docks."

7. A Watt medal, and the Manby premium, in books, to Guilford Lindsay Molesworth, Assoc. Inst. C.E., for his paper "On the Conversion of Wood by Machinery."

8. A Watt medal, to Thomas Spencer Sawyer, for his paper "On the principal Self-acting and other Tools employed in the Manufacture of Engines, Steam Boilers, &c."

9. A Council premium of books, to Frederick Charles Webb, Assoc. Inst. C.E., for his paper "On the Practical Operations connected with Paying out and Repairing Submarine Telegraph Cables."

10. A Council premium of books, to Henry Conybeare, M. Inst. C.E., for his paper, "Description of Works recently executed for the Water Supply of Bombay, in the East Indies."

11. A Council premium of books, to Samuel Alfred Varley, for his paper "On the Qualifications requisite in a Submarine Cable for most efficiently transmitting Messages between distant Stations."

12. A Council premium of books, to Richard Carden Despard, for his paper, "Description of Improvements on the Second Division of the River Lea, with Remarks on the Position of Canals generally."

13. A Council premium of books, to Alexander Wright, Assoc. Inst. C.E., for his paper "On lighting Mines by Gas."

14. A Council premium of books, to James Brunlees, M. Inst. C.E., for his "Description of the Iron Viaducts erected, across the Estuaries of the Leven and Kent, in Morecambe Bay, for the Ulverstone and Lancaster Railway."

SUBJECTS FOR PREMIUMS.—SESSION 1858-1859.

The Council invite communications on the following, as well as other subjects, for premiums :—

1. A Review of the Plans which have been proposed, at different times, for the Embankment of the River Thames.

2. On the Principles upon which the Works for the Improvement of River Navigation should be conducted, and the effects of the works upon the Drainage and Irrigation of the District; including accounts of the Systems of Moveable Dams ("Barrages Mobiles") in Rivers on the Continent.

3. On the effect of Engineering Works in causing injurious Scour, Flooding, or Silting-up, in Tidal Estuaries or Rivers.

4. The Inundations of the Rhone and the Saone in the year 1856, the causes to which they may be attributed, and the means for averting their recurrence.

5. On the Main Natural and Artificial Drains of the country, the extent to which they have been affected by the increasing amount of Agricultural Land Drainage, and the general influence upon the Main River Outfalls.

6. On reclaiming Land from Seas and Estuaries.

7. On the Results of the Employment of Steam-Tugs on Canals, and of other measures for the Improvement of Canals as a means of conveyance for heavy traffic.

8. On the Methods of constructing Foundations, for large Structures, in deep water.

9. The History and Practical Results of Timber and Iron Piling, for Foundations, or other purposes, and for Wharf and Dock Walls; with notices of the mechanism employed in driving, and of other modes of inserting the piles.

10. On Raising Submerged Vessels, and on Submarine Operations by means of Diving, or other Apparatus.

11. Description of Cast, or Wrought, Iron Cranes, Scaffolding, and Machinery, employed in large works, in Stone Quarries, Hoists, or Lifts on Quays, in Warehouses, etc., especially where either Steam or Water is used as a motive power.

12. On the Results of Experiments on the Crushing Weights of different materials, particularly as to the resisting powers of Rubble Masonry, set in different limes and cements.

13. The Selection of Sites for the Construction of Docks on the course of Tidal Streams, with reference to communication with Railways and with Inland Navigation.

14. The Selection of Sites for, and the Principles of, the construction of Breakwaters, Harbours of Refuge, Piers, Moles (whether solid or on arches), Sea Walls, and Shore Defences; illustrated by examples of known constructions.

15. The Construction of Lighthouses; their Machinery and Lighting Apparatus; with notices of the methods in use for distinguishing the different Lights.

16. On the Mechanical Methods of Boring and of Sinking large Shafts, of introducing the Tubbing and the impervious lining, and of traversing running sand and other difficult strata.

17. The Results of Contrivances for facilitating the Driving of Tunnels or Drifts in Rock.

18. The Results of a series of observations on the Flow of Water from the Ground, in any large district; with accurately recorded Rain-Gauge Registries, in the same locality, for a period of not less than twelve months.

19. On the Construction of Catch-water Reservoirs in Mountain Districts for the supply of Towns or for Manufacturing purposes.

20. Accounts of existing Water-works; showing the methods of supply, the distribution throughout the streets of Towns, and the general practical results.

21. The Comparative Duty performed by, and Improvements in the Construction of, modern Pumping Engines for Raising Water, for the supply of Towns, or for the Drainage of Mines; noticing in the latter cases the depth and length of the underground workings, the height of the surface above the sea, the geological formation, the contiguity of streams, &c.

22. The Results of the use of Bucket and Rotary Pumps, for lifting large quantities of water to a limited height; as at the Haarlem Meer, or at Whittlesea Mere: with descriptions of the Machinery employed, and the application of such machinery to the raising of the sewage of large towns.

23. On the Methods in use in various countries for Raising Water for the purposes of Irrigation.

24. The Drainage and Sewerage of Large Towns; exemplified by accounts of the systems at present pursued, with regard to the level and position of the outfall, the form, dimensions, and material of the sewers, the prevention of emanations from them, the arrangements for connecting the house drains with the public sewers, and the disposal of the sewage, whether in a liquid form, as irrigation, or in a solid form after deodorisation.

25. On Boiler Inspection as practised in this country and on the Continent, with remarks as to the comparative merits of the two systems.

26. On the most Recent Systems of Smoke Prevention, in Stationary, Marine, and Locomotive

Boilers; and a discussion of the existing difficulties.

27. On the Causes of the alleged Failure in Economising Fuel in working Steam expansively, and the probable conditions for insuring success.

28. A Practical Exposition of the Doctrine of the Mechanical Equivalence of Heat.

29. On the Results of the use of Superheated Steam.

30. On Substitutes for Steam, and the Causes of their Failure.

31. On the Results of the use of Tubular Boilers, and of Steam at an increased pressure, for Marine and other Engines, noticing particularly the difference in weight and in speed, in proportion to the Horse Power and the Tonnage.

32. On the Best Methods of Reducing the Temperature of the Engine and Boiler room of Steam Vessels, and of preventing the danger arising from the over-heating of the base of the funnel.

33. The Substitution of Machinery for Manual Labour, for Raising, Lowering, and Reefing the Sails, Weighing the Anchor, &c., on board ship.

34. On Steam Vessels of Light Draught for the Shallow Rivers of India, &c.

35. On the Form and Materials for Floating Batteries ("Vaisseau bélier"), and the points requiring attention in their construction.

36. On the Ascertained Duration, and other qualities, of the numerous systems of Permanent Way in use in England and in other countries, with their original cost and expense of maintenance.

37. Improvements in the Construction of Railway Carriages and Wagons, with a view to the reduction of the gross weight of Passenger Trains; also of Railway Wheels, Axles, Bearings, Axle-Boxes, and Breaks, and of Bearing, Traction, and Buffer Springs; treating particularly their ascertained duration and their relative friction.

38. Descriptions of the various kinds of Machinery in use in the principal Shipping Ports, for the Shipment of Coal; noticing particularly those in which the greatest expedition is combined with the least amount of breakage of the coal; and also accounts of the means of unshipping and measuring, or weighing the Coal, on its arrival in Port.

39. On the means of Utilising the products of the Distillation of Coal, so as to make coke commercially as cheap as coal; with descriptions of the Ovens, and of the best processes used in Great Britain and on the Continent in the manufacture of Coke.

40. The Precautions adopted for guarding against Accidents by Fire-damp and After-damp in Mines.

41. The most Effective Arrangement and Form of Centrifugal and Reciprocating Blowing Apparatus.

42. The Chemical Analysis, and the application to economic purposes, of the Gases generated in Iron Blast Furnaces.

43. Description of Modifications of the present systems of Smelting Iron Ores, of improvements in the conversion of cast iron into the malleable state, and of the manufacture of iron generally, comprising the distribution and management of Iron Works.

44. An Investigation of the Causes of "Red" and of "Cold-Shortness" in Malleable Iron, and other Chemical Characteristics which affect the Physical Properties of Cast or of Wrought Iron.

45. On Flaws in Boiler Plates and Forgings of large dimensions, with suggestions for diminishing the liability of their recurrence.

46. Improvements in the Manufacture of Iron for Rails and Wheel Tyres, having special reference to the increased capability of resisting lamination and abrasion; and accounts of the Machinery required for Rolling heavy Rails, Shafts, and Bars of Iron of large sectional area.

47. On the use of Steel Bars and Plates in Engine work and Machinery for Boilers and for Shipbuilding.

48. The Process of Manufacture, and mode of treatment, of Aluminium.

49. On the Importance of Balancing the Rotating or Alternating parts of Machinery.

50. On the Forms and Dimensions of Journals of Machine-shafts, Axles, &c.; with the best Composition for the linings of bearings, and the most approved methods of lubricating.

51. On the Mechanism of Astronomical Instruments, with suggestions for its improvement.

52. On Machinery adapted for the Better Separation of the various substances found in Combination with Metallic Productions.

53. On Machinery for Crushing Ores.

54. On the Substitution of Machinery for Manual Labour in Mining Operations; and on Hydraulic Machinery in Mines.

55. On the Improvements which may be effected in the Buildings, Machinery, and Apparatus for producing Sugar from the Cane in the Plantations and Sugar-works of the British Colonies, and the comparison with Beet-root, with regard to quantity, quality, and economy of manufacture.

56. Accounts of the Improved Systems of Storing, Cleansing, and Drying Corn, and of producing Flour.

57. Description of the Machinery adapted for the Preparation of Indian Cotton.

58. Improvements in Flax Machinery, and in the processes for preparing the Flax for manipulation.

59. The uses of Vulcanized or Mineralised Caoutchouc; the means of increasing its durability, and the modes of causing its adhesion to metal.

60. On the Application of Photography to Engineering.

61. The Construction of Clocks to be moved simultaneously by the agency of Galvanic Electricity.

62. On the Form and Construction of Submarine Telegraph Cables, most suitable for certain specified depths; and an investigation into the nature of any new substances adapted for the insulating medium.

63. Memoirs and accounts of the Works and Inventions of any of the following Engineers:—Sir Hugh Middleton, Arthur Woolf, Jonathan Hornblower, Richard Trevithick, William Murdoch (of Soho), Alexander Nimmo, and John Rennie.

Original Papers, Reports, or Designs of these or other eminent individuals, are particularly valuable for the Library of the Institution.

The communications must be forwarded, on or before the 30th of January, 1859, to the house of the Institution, No. 25, Great George-street, Westminster, S.W., where copies of this paper and any further information may be obtained.

CHARLES MANBY, *Secretary*.

25, Great George-street, Westminster, S.W., October, 1858.

CAPTAIN TALBOT'S PATENT SELF-DETACHING HOOK.

THE following is Captain the Hon. William Talbot's description of a self-detaching hook recently patented by him:—

When lowering and disengaging boats from ships considerable difficulty and danger are experienced in obtaining the release at the instant of the boat's coming in contact with the water, and the object of my invention is, that the hooks attaching the boats should be so formed that so soon as the weight of the boat is removed therefrom by contact with the water such hooks may be self-releasing. For this purpose, each hook or support is formed by two levers, one end of each of which is connected by a pin joint to the other, whilst

the axes of motion of these levers diverge therefrom, and are the points of their suspension from two separate links, which hang from a ring common to both. The lower ends of these levers are bent into the form of a hook, and are capable of lying one across the other. When by a ring or otherwise a weight is applied to their hooked ends, and they are caused thus to cross each other, in that position they form a secure support; but so soon as the weight is relieved therefrom the tendency of these levers is by their form to open or separate at their hooked ends, and clear the ring or other attachment by which they held the weight. Supporting connections thus formed are applicable as self-acting releases when lowering merchandise, minerals, &c., and thereby save labour.

Fig. 1 is a view of Captain Talbot's

Fig. 1.

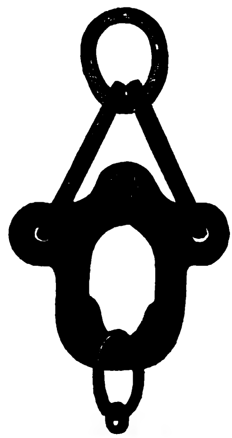


Fig. 2.

hook in the position which it takes when a weight is attached to it; and fig. 2 is a view of the hook after the weight has been released.

A NEW METHOD OF FORMING AND LAYING SUBMARINE TELEGRAPH CABLES.

Gentlemen,—While passing over the middle of the Electric Cable, of which I saw one end put on board the *Agamemnon* in the Thames, and the other end taken out of the *Niagara* in America, an idea was suggested which may be worthy of consideration. Instead of making a cable of hard and soft materials to be pressed and twisted in uncoiling, let us suppose that a simple copper wire cord is wound upon a drum, and then covered *as it is passing from the vessel.*

The strain upon the wire would bear upon it while yet independent of the covering, and the wire should run through a bath of liquid gutta percha on board the vessel, and then through one of asphalte, paint, or pitch, or even of melted lead (which is found feasible in America) just before it issues forth into the sea.

A rope of this sort could be delivered at the rate of three or four miles an hour, as it is, in fact, covered at this rate at the Gutta-Percha Works. It would take up very little room, and the gutta percha would suffer no pressure from the weight of overlying coils or the friction of breaks, and it might be made light enough almost to float on the water or to sink very gradually.

Such a cable would be without any iron covering, but I think that any cable that depends on its covering for protection from abrasion after it is laid cannot last much longer than a light and cheap rope, especially if it lies at a depth below all currents.

At the two ends where the cable lies in shallow water, of course a stronger piece should be attached.

I am, Gentlemen, yours, &c.,

J. M.

R.M. Steamer *Canada*, off Newfoundland, October 23.

THE ATLANTIC CABLE.

To the Editors of the Mechanics' Magazine.

Gentlemen,—I beg to hand you a report of

Hydraulic Experiments at Messrs. Easton and Amos's, Engineers, Southwark.—Feb. 19, 1857.

BY E. O. WILDMAN WHITEHOUSE, ESQ.

Experiment 1.—12 in. of single covered core had 25 holes punched in, rendering metal conductor visible at every hole, and each exposing a bare metallic area of 1-16th of an inch.

This was passed through the 2nd covering machine in the ordinary way, no extra care being taken to secure the insulation of these places.

This layer is scarcely more than half the thickness of the outer covering, being, in fact, considerably under the 16th of an inch.

The specimen thus prepared was then submitted to the enormous pressure of nearly 5 tons to the inch, its insulation being tested by a most delicate galvanometer in conjunction with a battery of 500 qrs.

The pressure was maintained for upwards of five minutes without the least injury to the insulation of the wire so severely tried.

Experiment 2.—A second similar specimen was then submitted to the like conditions, and with the same result.

Experiment 3.—Another specimen of double-covered core was pierced by a similar number of still larger holes, laying bare the conductor to the extent of 3-16ths of an inch at each aperture; this was then passed through the 3rd covering machine, similarly arranged, and tested.

The results were equally satisfactory.

Experiment 4.—Another specimen was prepared in the same manner, and subjected to like conditions, with the same result.

N.B.—The diameter of the ram was 18 inches, the lifting force was equal to 1,200 tons, in each instance the safety valve was loaded to its maximum pressure, blowing off all the time.

Of course it is simply impossible to please all parties, and some won't be convinced against their will. If the experiments were perfectly valid and conclusive, then they were not tried long enough, and if long enough their imagination would instantly conjure up some other lion in the way. But to the intelligent and sober-minded I would suggest that under all the circumstances of the case, five minutes was an ample allowance for each experiment—the more so, as the trials were *so* severe, and the tested gutta percha *so* thin, &c., &c.

One word for my friend the "Telegraph Engineer:" it may please him to call me "clerk," but he has no warrant for so doing, and, as to the "no electrician," people who can talk such grandiloquent nonsense about "the great laws of electro-motive force and resistance," when *they* throw stones they should be reminded of their own fragile tenements.

I am, Gentlemen, yours, &c.,

SAMUEL E. PHILLIPS,

Late Electrician's Assistant to the A. T. C.

THE SUBMARINE ELECTRIC TELEGRAPH SYSTEM.

GENTLEMEN,—I have been a subscriber to your valuable Magazine for nearly thirty years, and I never remember anything half so puzzling as this telegraph affair seems to be to all concerned.

On reading Mr. Newall's rather laudatory opinion of himself before the British Association the other day, as the best wire-rope maker in the kingdom, I thought if all was true they had certainly knighted the wrong man; but the fact was he was bidding high for the Red Sea line all the while.

Now, Gentlemen, it appears to me, if they don't alter the principle of making telegraph ropes—for that is all they really are at present—it is impossible they can expect them to last. What is the effect of a rope of this kind stretching on a soft core? Just this, the core becomes compressed, and if it don't stretch enough it must break, so that the very covering, instead of being a protection, is absolutely its own destruction. This is what has happened to the Atlantic, and I see by the *Builder* that the French, Sardinian, and Algerian line has become helpless by the same process.

What will the shareholders of the Red Sea line think after this? will they stand by and be fleeced? Don't you think it would be better to have a little competition, and see if something cannot be found that will effectually protect the copper wire, and be what it professes to be, a real *telegraph cable*?

Mr. Brett, I think, wishes something like this when he says it will not do to keep on laying down wires in this way and get no returns. He is something like Mr. Newall, bidding for some object, only he does it in a different style, something like that of Cheap Jack—"What we have done for you is good for nothing, but what we mean to do will be fifty per cent. better." Now what that will be I leave for some of your mathematicians to calculate.

Now the only difficulty I see in the way is a huge monopoly; but I hope the time is now come when the public will think for themselves, and not only think but act, and not trust so much to the kindness of those gentlemen who wish to do the work for them.

Indeed, I believe the time has come when it would be prudent for both the Government and the Indian Council to step in and make the shareholders be just to themselves; after so many failures they cannot expect any assistance from them except they show some improvement; besides, it prevents our scientific men from turning

their attention to it as they ought, knowing that except there is some alteration it is useless to waste their time.

Hoping this may be worthy of a place in your Magazine,

I am, Gentlemen, yours, &c.,

A VERY OLD SUBSCRIBER.

October 25, 1858.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

COUPIER, J. T. *Treating vegetable fibrous matters, to render them applicable for the manufacture of paper and pasteboard, and in apparatus connected therewith.* Dated Mar. 13, 1858. (No. 508.)

This relates to a method of boiling, washing in lye, and reducing fibrous vegetable matters to pulp for paper, pasteboard, &c., by the use of superheated steam. The patentee uses all kinds of vegetable matters of a fibrous cellular tissue.

PARMELEE, S. T. *A new mode of combining certain materials to be used in the manufacture of boots and shoes.* Dated Mar. 13, 1858. (No. 511.)

This consists in applying strips or layers of india rubber, gutta percha, or a combination of both, to the surface of cloth, leather, &c., for forming the uppers of boots or shoes, by means of smooth metallic surfaces, between which they are submitted to heat and pressure for a few seconds.

PIGOTT, G. *Improvements in jacquard machinery for figuring lace and other fabrics.* Dated Mar. 13, 1858. (No. 512.)

The patentee employs apparatus to move the top and bottom bars used in lace and other machines without using what is called a "Manchester top;" the card cylinders have only an up and down motion, which places the droppers where required. The cams which give the requisite movements to the top and bottom driving bars are placed on the same shaft as the cams which drive the card cylinders; or they may be placed on a second shaft below, as found most convenient, without the use of strings to the droppers, or a "Manchester top" to move the said strings.

WALKER, S. *Improvements in the manufacture of tubes of copper and alloys of copper.* Dated Mar. 13, 1858. (No. 513.)

Here the patentee takes a skelp of sheet copper, turns up one end, places it on a mandril, and passes the turned-up end of the skelp with the end of the mandril through a lapping hole fixed in front of a pair of rolls having grooves of the size of the tube to be made. The skelp and mandril are seized by the rolls, and drawn through the lapping hole, by which the skelp is lapped into a tubular form upon the mandril, the form being perfected by the rolls after leaving the lapping hole. The pressure of the rolls bevels the edges of the metal, and facilitates the brazing.

JAMESON, J. *Improvements in apparatus for compressing and expanding aeriform fluids.* Dated Mar. 13, 1858. (No. 514.)

The patentee, by a combination of old apparatus, and by applying heat consecutively to elastic fluid contained in close vessels, employs the pressure produced in one vessel for the production of increased pressure in a second vessel, and so on to any extent, thus obtaining a high pressure while using a moderate degree of heat. He can attain a partial vacuum by the use of like apparatus.

NEWTON, A. V. *Improved machinery for making horse-shoes.* (A communication.) Dated Mar. 13, 1858. (No. 516.)

This relates to machinery whereby bar iron is cut into lengths, bent to a horse-shoe form, and impressed between dies to complete the horse-shoe by a rapid succession of operations. It cannot be described without engravings.

OSMOND, S. T., and E. D. COLLINS. *Improvements in ploughs.* Dated Mar. 13, 1858. (No. 517.)

The fore end of the plough is mounted on a light fore carriage on wheels, in the upper cross bar or frame of which a rack bar is mounted to slide up and down. This rack has a ring to support the fore end of the plough in the upper frame; a pinion gears with the rack; a screw is also fitted in this frame, which gears with the pinion, and imparts motion to it, the whole remaining in gear with the rack in any required position. The axis of the screw is in line with the direction of the length of the plough. A light shaft is carried backwards to a hand-wheel placed between the hand holds of the plough, by which the ploughman can from time to time easily elevate or depress the fore part of the plough.

MARTIN, J. C. *An improved plastic compound for the manufacture of moulded articles, to be used as a substitute for wood carvings, and for many of the purposes to which papier mâché is applicable.* Dated Mar. 15, 1858. (No. 518.)

The patentee claims combining resin, pitch, &c., with wet pulp, the kneading thereof into a plastic compound, and the manufacture of moulded articles therefrom.

EDWARDS, R. *Improvements in preparing and combining materials used in lighting or kindling fires.* Dated Mar. 15, 1858. (No. 520.)

This consists in passing a string through the substance of the component parts of each fire-lighter, and in stamping a name or mark upon the wood simultaneously, and in one operation with the action of compressing the same.

BROOMAN, R. A. *Improvements in sewing machines.* (A communication.) Dated Mar. 15, 1858. (No. 522.)

This has relation chiefly to the looping, feeding, and thread-tension apparatus, and is intended for sewing with a single thread, to form the chain-stitch. The operations of catching, holding, and spreading the loop in the path of the needle, are effected by a single piece vibrating upon an axis, the vibrations being timed with the movements of the needle to produce the several effects named.

AKED, J., and J. CRABTREE. *Improvements in the arrangement of machinery or apparatus for warping and beaming yarns for weaving.* Dated Mar. 15, 1858. (No. 526.)

This has reference to a patent dated 29th Feb. 1840, and relates to means of forming certain yarns known as "grandrell," into warps, and winding the same on the warp beam ready for the loom. It consists in arranging apparatus so that a sufficient number of yarns to form a full warp can be conducted from the warping bobbins direct to the warp beam at one operation.

RUSSELL, J. S. *Improvements in preserving the bottoms of iron ships and vessels.* Dated Mar. 15, 1858. (No. 527.)

This invention was described at p. 292, No. 1833, vol. 69.

HAMILTON, J., jun. *Improvements in apparatus for propelling vessels.* Dated Mar. 15, 1858. (No. 528.)

The patentee employs endless chains of float boards passed around cylinders, and curved to facilitate their entrance into the water.

WALLIS, A., and C. HASLAM. *Improvements in engine, machine, and other like bearings.* Dated Mar. 15, 1858. (No. 529.)

This consists in a novel construction of the seats of plummer blocks and bearings in general, which allows of their accommodating themselves to any ordinary deflection of the axles or spindles working in them, so as to prevent their binding, wearing crossways, or any like derangement. The invention cannot be described without engravings.

D'ARGY, E. A. L. *A new or improved rotary hydraulic blowing machine.* Dated Mar. 15, 1858. (No. 531.)

This machine is composed of three or more bent tubes arranged iu a circle, and turning in a both of

water. These tubes take in by their open extremities the air or gas and the water in the bath, and impel all towards the centre, the water returning to the bath while the air is forced towards the fire.

GALLAFENT, D. *Certain improvements in machinery or apparatus for cooling liquids and condensing vapours.* Dated Mar. 16, 1858. (No. 532.)

The patentee places a thin copper pipe within a vertical iron pipe, leaving an annular space between them. In the centre of the copper pipe (which, as well as the iron pipe, is closed at top and bottom with a blank flange) there is a vertical spindle having a vane or blade the whole length of the pipe, to which a quick rotary motion is given to impart a like motion to the hot liquid passing through the tube, as well as a centrifugal motion. The liquid to be cooled will thus be continually thrown from the centre of the vessel to the side. A constant stream of cold water is caused to flow through the annular space, and to produce a change in the particles of this water he fixes on the interior or in the exterior cylinder the thread of a screw. Apparatus of essentially the same character may be used for condensing steam, &c.

HALL, G. *Certain improvements in cartridges and gun wads.* Dated Mar. 16, 1858. (No. 533.)

The patentee secures, by gumming or otherwise, straps of tape, &c., to the bottom of the cartridge case, and after charging the case he passes it through a ring of paper, leather, or metal, &c., allowing the ring to remain at the top of the cartridge, and to this ring the strap is brought up the sides of the cartridge and secured. The cartridge being slightly conical is readily put into the muzzle of the gun, until the ring is brought in contact with the end of the barrel. The forcing of the cartridge down causes the strap to tear the paper, &c., at the bottom of the cartridge, and allows the powder to shake down the barrel into the nipple, the empty portion of the case with the wad and shot going down on it in a compact mass. On withdrawing the ramrod the strap will be found still attached to the ring, which with the strap may be allowed to fall as waste, or be preserved.

LE CAPELAIN, P. *Improvements in dry gas meters.* Dated Mar. 16, 1858. (No. 537.)

The patentee arranges the meter with, say, three measuring compartments, each having an inlet and outlet passage, and each passage a separate valve. The valves are of the "flute key" kind, but the hinged ends allow the valves to rest fully on their seats, while the other ends are operated by rods from an eccentric connected with moveable diaphragms. The inlet valves are in a separate chamber. Suitable indicating and registering apparatus is employed.

CLARK, W. S. *Improvements in machines for cutting and harvesting grain and grass crops.* (A communication.) Dated Mar. 17, 1858. (No. 538.)

This consists, 1. In so constructing the frame of a combined reaping and mowing machine, and combining it with a spring track clearer, that the portion of the frame in rear of the cutter bar may be removed when lodged grass or grain is to be cut, and the machine still preserve its balance. 2. In so arranging the cutter wheel and its block, that the castor block and tongue may form a mutual support to each other. 3. In a peculiar device for throwing in and out of gear those portions of the machine which do not receive motion from the horses. This is accomplished by a clutch lever with cam planes.

TODD, W. and J. *Certain improvements in power looms for weaving, and in shuttles to be employed therein.* Dated Mar. 17, 1858. (No. 541.)

This invention applies, 1st, to power looms in which moveable shuttle boxes containing a numbe of shuttles are employed, and it relates to a method of actuating and regulating the motions of such shuttle boxes. It relates, 2. To the moveable shuttle box (of such looms), in which three or more channels or boxes are formed to contain three or more shuttles, and consists in placing a curved bracket behind the back springs of these shuttle boxes. 3. It relates to the "tappet motion," employed when a number of healds are used, and is applicable to all descriptions of power looms. The apparatus consists of two or more shafts placed around one central shaft, and all connected and driven by spur gearing. Upon each outside shaft may be placed cams which act upon treddles in connexion with the healds, the entire combination being worked by an arrangement of pattern disc or pattern chain, the object being to weave one pattern of fabric by the use of one cam, so that a number of different fabrics (such as twills, satin tops, &c.) may be woven consecutively in one piece. Another method is to cause the tappets as ordinarily used to work the treddles by the pressure of an intermittent roller tappet or cam mounted upon a link hinging upon each of the treddles, the links being in connexion with a pattern disc. 4. It relates to the heald motion of looms where only two healds are employed, and consists in attaching, the "heald straps" to one half of a "clutch box," which is made to slide to and fro upon a rocking shaft upon which the other part is secured, and, during the passage of the shuttle for as many picks as are required, the loose part of the "box" being steadied by a pin or stud fitting therein; but when the box is in gear the healds are moved by the rocking shaft at every pick. 5. It relates to a method of regulating the tension of the yarn beam, which consists in attaching a spring to the slay-sword, and connecting it to the rope or band passing round the warp beam, so that at each beat up of the slay extra tension will be placed upon the yarn as required. 6. It relates to the peg or pin of the shuttle upon which the weft is placed. The improvement consists in dispensing with the ordinary solid pin having springs thereupon, and substituting wires or springs secured together at each end and widening towards the middle, which will exert pressure upon the interior of the bobbin or cap more evenly, and will retain it more securely in the shuttle.

CLARK, W. S. *Improvements in metallic canisters for holding gunpowder and articles of a similar nature.* (A communication.) Dated Mar. 17, 1858. (No. 542.)

This consists in the corrugating the body of a metallic keg to correspond in appearance with the hoops of the wooden keg, and connecting these corrugations with the bulged portion of the keg, combined with a brace moulding in addition to the plain head of the keg for giving strength at the perimeter of the head and ends of the cylinder projecting beyond the heads. Also in constructing the screw or stopper by forming slots in the raised rim thereof for the reception of a piece of tape; the securing the ends of the tape under the manufacturer's label will prevent counterfeiting of the contents of the keg.

HINE, T. C. *Improvements in lighting and ventilating by gas.* Dated Mar. 17, 1858. (No. 545.)

The patentee uses a series of horizontal flames of gas issuing from a ring, and over this ring places a dome of glass, &c., from the summit of which passes a pipe, through which the products of combustion are conveyed out of the room. The lower part of this dome may be closed by a disc of glass, perforated for the admission of air. On the outside of the combustion pipe he uses a larger pipe, and through the annular space between these two pipes fresh air is conducted into the room.

BROOMAN, R. A. *Improvements in the construction of boxes or cases for trees, flowers, and other horticultural and floricultural purposes.* (A communication.) Dated Mar. 17, 1858. (No. 547.)

The four corner pillars are of angle iron, an inner angle iron frame sliding into an outer frame so as to leave room between the two frames at each corner for the reception of the slides, which may be of wood, iron, or slate; a screw bolt holds the whole together at each corner, and an ornamental ball

forms a finish, and serves to tighten up the bolts. The bottom of the case rests upon metal bearers, which are notched to fit over the lower part of the side pillars. An aperture is made at bottom through the outer corner frames, through which sulphur, &c., may be introduced to prevent the breeding of insects.

WARD, W. *New or improved machinery for the manufacture of nails, spikes, bolts, rivets, screw blanks, and nuts.* Dated Mar. 17, 1858. (No. 548.)

This invention cannot be described without reference to the drawings.

FLETCHER, L. E. *Improvements in marine engines and boilers, and their appurtenances.* Dated Mar. 18, 1858. (No. 550.)

This includes a mode of applying an artificial draught to the furnaces of marine boilers by forcing air into a close stoke-hole maintaining a greater pressure than that of the external atmosphere: the combination of an engine having a surface condenser with a tubular boiler provided with a fan or pump for producing artificial air draught in its furnaces: the combination of a steam engine having a surface condenser with a tubular boiler having hanging bridges behind the ordinary bridge in its furnaces, and provided with a fan, &c., supplying the waste of distilled water in marine engines working with surface condensers by an auxiliary engine driven by steam from an auxiliary boiler, or from a separate compartment of the main boiler, and which exhausts into the main boiler: a mode of heating the cylinders or pistons, or both, and supplying the waste or distilled water in such engines by introducing steam into the steam jackets from an auxiliary boiler or from a separate compartment of the main boiler, which steam, or the water condensed from it, is afterwards conducted into the main boiler; a mode of introducing heaters into the cylinders, or on or in the pistons of steam engines: a mode of producing a circulation of steam through the jackets or heaters of cylinders and pistons by pumps: the application of the syphon well to marine engines.

GLANVILLE, R. *Improvements in condensing steam engines.* Dated Mar. 18, 1858. (No. 551.)

The exhaust steam in its passage to the condenser passes through tubes, or chambers, amongst which the feed water passes to the boiler.

DUNLOP, A., and A. STARK. *Improvements in dressing or sifting flour and meal, or reduced grain.* Dated Mar. 18, 1858. (No. 555.)

This partially relates to a former patent, dated 6th Oct., 1856. Here the dressing or sifting is effected by moving the frame to which the cloth is attached rapidly up and down in a vertical, or approximately vertical, direction.

SUFFIELD, T. *Improvements in pumps especially adapted for ships' purposes.* Dated Mar. 18, 1858. (No. 556.)

This consists in certain arrangements of pumps whereby all liability to choke is avoided, and whereby a pump or two pumps, either single or double acting, are applicable as fire engines. The invention cannot be described wishout engravings.

NEWTON, A. V. *An improved process of polishing, blueing, and annealing articles of iron and steel.* (A communication.) Dated Mar. 18, 1858. (No. 560.)

After the rods, &c., have been drawn out and are cool, they are plunged into an acid bath to remove the scale. They are next washed to remove the acid, and then pressed between smooth rollers, which gives them a polished surface. To colour the bars or sheets they may be submitted to the action of a bath of molten lead, zinc, or any alloy of metal that will fuse under a moderate temperature.

CROLL, A. A. *Improvements in the manufacture of parts of dry gas meters.* Dated Mar. 18, 1858. (No. 561.)

In constructing the valve seats, where the valves or covers slide to and fro over every part of such seat, the patentee reduces the width of the surfaces or bars between the openings in the valve seats, and retains only such portion of those surfaces as is necessary to secure the due measurement of the gas; and, by preference, he forms the exit opening larger than the others. He also forms the valves or covers of an alloy different to that of which the valve seats are formed.

ABETS, P. F. *Improvements in the construction of railway rolling stock, and in the lubrication thereof, and other moving parts of machinery.* Dated Mar. 19, 1858. (No. 563.)

This cannot be described without engravings.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

EMPSON, J. F., jun. *An improvement or improvements in ornamenting certain kinds of buttons.* Dated Mar. 15, 1858. (No. 530.)

This consists in painting designs upon the faces of covered buttons.

HENRY, M. *Improvements in the manufacture or production of artificial marble frescoes and decorative, ornamental, and artistic surfaces, objects, and works.* (A communication.) Dated Mar. 16, 1858. (No. 534.)

Here artificial marble frescoes, and decorative and artistic surfaces, are produced by preparing a surface stucco or composition of a combination of pulverized marble and lime, and applying thereon colours prepared witb albumen. The composition brought to a pasty consistency may be readily laid on a wall, &c., or formed into solid bodies of any desired shape.

LAWSON, J. *Improvements in machinery used in spinning flax and other fibrous substances.* Dated Mar. 16, 1858. (No. 536.)

These are applicable to hot-water spinning frames, and consist in supporting the saddle with the pressing rollers by a pendent arm or arms, in place of employing the stands or supports projecting from the beam, as heretofore.

VASSEROT, C. F. *Improvements in the treatment of horn, and in the application of it when so treated as a substitute for whalebone in the manufacture of umbrellas, parasols, and similar objects.* (A communication.) Dated Mar. 17, 1858. (No. 539.)

The horn is sawn in the direction of its grain, soaked in cold water, and exposed to a fire until softened; it is then placed in a bath of lukewarm water, and afterwards put between iron plates, well polished, and heated to about 80 or 100 degrees. The plates are lubricated with grease. This pressure equalises the thickness of the horn. A second pressure is then given to it between two plates of very hard wood, when it cools and becomes perfectly straight.

NICOLL, D. *Improvements in machinery for cutting out military, naval, and police uniforms, and other clothing.* Dated Mar. 17, 1858. (No. 540.)

This machine may be operated by power or by hand. The cloth must be arranged in folds to suit the garment by a rod, pointed or hooked at both ends and fixed in the centre on an axis. The cutter consists of a frame of iron fashioned to the required form, and constructed to admit of the insertion of cutters or knives of well-tempered steel, secured therein by screws. The frame gives the form, and the blade cuts out the cloth to the extent of its diameter, on the application of pressure.

GOODERHAM, J. *Improvements in shoemakers' wax.* Dated Mar. 17, 1858. (No. 543.)

This wax is composed as follows:—Gutta percha (about) 20 parts; pitch, 58 parts; soap, 5 parts; rosin, 6 parts; beeswax, 5 parts; palm oil, 1 part; tallow, 5 parts.

BEATSON, W. C. *Improvements in apparatus to be used in the manufacture of glass bottles.* Dated Mar. 17, 1858. (No. 544.)

A pair of dies is here used to form the lips on the ends of the necks of bottles, one die fixed and the other moveable. A ram is fitted to slide in the

larger parts of the dies, and on the end of the ram is a cone for entering into the neck and pressing the plastic glass outwards while the end of the ram is forcing back the glass at the end of the neck.

Evans, T. *Improvements applicable to the manufacture of parasols.* Dated Mar. 17, 1858. (No. 546.)

This consists in making the ornamental borders separate from the other part of the piece of silk.

Oxley, J. *An elastic cushion or fitting piece for windows, blinds, shutters, and doors, which is also applicable for other purposes.* Dated Mar. 17, 1858. (No. 549.)

The inventor forms a coil, roll, or pad of india rubber, and places it in a metal frame, to project from the face thereof. It is protected from friction by a curved clip or band, which is free to move into and out of the metal frame or box, as the elastic material is compressed and expands upon the removal of the pressure.

Doley, C., E. Bigland, and T. H. Worrall. *Improvements in ornamenting metals.* Dated Mar. 18, 1858. (No. 552.)

The inventors draw upon glass the required design, with a composition of beeswax, tallow, and pitch. They then sink the uncovered parts of the glass with hydro-fluoric acid, then scrape the composition off the glass, and imbed the glass in plaster of Paris on a slate slab. They next fill up the sunken parts with beeswax, shellac, tar, varnish, and gas black. They take an impression from the glass plate on unsized paper, damp the paper, and place it face downwards upon the metallic surface, then press the paper upon the article with an india-rubber roller, and afterwards wash off the paper with warm water and soap. They place the metal article thus prepared in a tank filled with dilute nitric acid, or such other acid as will dissolve the metal to be ornamented. When the acid has sufficiently acted upon the article, it is removed and washed with potash, lime, soap, and water. This removes the composition from the article, and the article has the design or pattern sunk in the substance of the metal.

Anderson, Sir J. C. *Improvements in locomotive and other carriages.* Dated Mar. 18, 1858. (No. 554.)

This consists, 1. In fixing horizontally and longitudinally a cylinder on the top of a tubular boiler, the two being united by vertical pipes. The horizontal top cylinder is used as a steam chamber. By this arrangement the tube cylinder and fire box can be kept almost full of water, which will secure them from being left uncovered with water on ascending hills. 2. Of a universal railroad. The wheels of engines, carriages, &c., are to be placed within other larger wheels. The spokes of the large wheels are to be fixed to the rims of the wheels, as close as they can be to the outside, leaving a sufficient breadth of rim to form the railroad on which the inner wheels can run.

Brooman, R. A. *An improved knee-cap.* (A communication.) Dated Mar. 18, 1858. (No. 557.)

This consists in constructing knee-caps in caoutchouc, gutta percha, &c., with a hollow at the back to allow of the play of the joint, and with a padding in front to prevent injury from a fall or from kneeling. Perforations should be made for ventilation.

PROVISIONAL PROTECTIONS.

Dated September 22, 1858.

2132. C. W. Harrison, of Woolwich, engineer. Improvements in filters for purifying air and liquids.

Dated October 11, 1858.

2260. R. Cowen, jun., of Nottingham, mechanical draughtsman. Improvements in dressing lace or other fabrics made of silk, cotton, or other material, and in apparatus employed therein.

Dated October 12, 1858.

2269. J. F. Swinburn, of Birmingham, gun maker. Improvements in fire-arms.

2271. T. C. Shaw, of Hanley, Stafford, architect, and F. H. Cooper, of Hanley, ironmonger. A new or improved construction and mode of working engines by the agency of air or gases in conjunction with electricity for obtaining or producing motive power.

2273. W. Smith, of Edinburgh, lithographer. Improvements in transferring drawings or delineations in lithographic and zincographic processes.

2275. J. A. Gasse, of Paris, merchant. Improvements in railway breaks, and in apparatus for working the same.

Dated October 13, 1858.

2278. J. Parkins, of Hanway-st., Oxford-st., envelope maker. Improvements in securing envelopes, and in fastenings to be used therein.

2279. H. Parker, of Sledmere Castle, York, farmer. An improved apparatus for the cultivation of land and other agricultural operations.

2280. R. Ridley, of Low Wortley, York, engineer. Improvements in safety cages for mine shafts.

2281. W. H. Treacher, of Blackfriars-road, surgical mechanician. Improvements in respirators.

2282. A. G. Bradby, of Reading, gentleman. An improvement in connection with collars and ties, or other like articles of dress.

2283. A. Benda, of Basinghall-st., importer of foreign goods. Improvements in the manufacture of models of the human and other figures, to be used as toys, for tuition, and for other purposes. A communication.

2284. J. Braby and J. Braby, jun., of Newington-causeway, wheelwrights. Improvements in wheels and wheeled carriages to be propelled by steam, horse, or other power, and in apparatus for retarding the same.

Dated October 14, 1858.

2285. J. C. Ollerenshaw, of Manchester, merchant. An improvement in "cotton gins." A communication from L. S. Chichester, of New York.

2286. H. Liddle, of Tonge, Lancaster, silk manufacturer, and J. Booth, of the same place, dyer. Certain improvements in machinery or apparatus for polishing and finishing yarns or threads.

2287. L. Cowell, of Adelphi, gentleman. Improvements in apparel affording the means for preserving life at sea, and to prevent accidents to persons casually immersed in water.

2289. A. Gordon, civil engineer, of Whitehall. Improvements for manufacturing cast iron, steel, and wrought iron. A communication from A. G. Cazalat, of Paris.

2291. T. Ingram, of Bradford, York, foreman. Improvements in means or apparatus for signalling between the parts of a train of carriages.

2293. S. Perkes, of Clapham. Improvements in machinery for extracting oil from the cocoa nut and other vegetable matters.

2294. H. Martin, of Old Kent-road. Improvements in separating starch from gluten, in apparatus used therein, and also in preparing cement from gluten.

2295. G. Baxter, of Northampton-sq. Improvements in colouring photographic pictures.

2296. T. Archer, jun., of Dunston, near Gateshead. Improvements in apparatus for preventing explosions of steam boilers.

2297. S. Diggle, of Radcliffe, Lancaster, machine maker. Improvements in looms for weaving.

2298. W. E. Newton, of Chancery-lane. An improved construction of cabin or state room for steam boats and other vessels. A communication.

2299. J. Lomas, of Manchester, calico printer. Improvements in the production of ornamental fabrics for ladies' dresses.

Dated October 15, 1858.

2300. R. R. Jackson, of Blackburn, cotton spinner. Certain improvements in machinery or apparatus for sizeing yarn.

2301. W. Bacon, of Prestwich, Lancaster, en-

gineer. Improvements in the mode of constructing valves, valve cocks, gates, and stop cocks, which may be used in steam engineering, and for other purposes. A communication from J. R. and H. S. Robinson.

2302. G. Davies, of Serle-st., Lincoln's-inn. Improvements in the manufacture of gloves, and in the apparatus employed therein. A communication.

2303. T. Moore, brewer, of Sheffield. Improvements in refrigerators.

2304. S. T. Clarke, of Kildare-terrace, Westbourne-park, gentleman. A mode of crossing banker's cheques and drafts.

2305. J. Wainwright, of Birkenhead, dental surgeon. Improvements in respirators.

2306. G. T. Bousfield, of Brixton. Improvements in machinery for cutting the threads of wood screws. A communication.

2307. G. F. Wilson, of Vauxhall. Improvements in preparing compounds containing sulphur for preventing and destroying blight, mildew, and insects.

Dated October 16, 1858.

2308. L. Marcus, of Algiers, gentleman. An improved reaping machine.

2309. F. J. Coulon and S. G. Giraud, of Paris. Improvements in the process of ornamenting skin and leather.

2310. T. W. G. Treeby, of Westbourne-terrace Villas, gentleman. An improvement in breech-loading fire-arms and cannon.

2311. H. Francis, of the Strand, engineer. Machinery for making the springs of surgical trusses.

2313. J. Hick and W. Hargreaves, of Bolton-le-Moors, engineers, and R. Harwood, of the same place, millwright. Improvements in governors or regulators for prime movers.

2314. P. Jensen, of Copenhagen, engineer. An improved apparatus for governing or regulating the speed of marine engines.

2315. A. Robertson, of Lounsdale, Renfrew, bleacher. Improvements in applying starch and similar matters.

2316. A. Dunn, of Dalston-terrace East, soap maker. An improvement in preparing marking compounds to be used on linen and other fabrics.

2317. B. Nickels, of Mitcham, chemist. Improvements in electric telegraphs.

Dated October 18, 1858.

2318. W. Clay, of Ellesmere, Shropshire, agricultural implement maker. Improvements in combined thrashing and dressing machines.

2319. J. A. Mason, of Wirksworth, Derby, land surveyor. Improvements in washing machines and apparatus for wringing and mangling.

2320. W. A. F. Powell, of Bristol, potter. Improvements in stopping or closing jars and bottles.

2321. C. West, of Camberwell New-road. Improvements in the mode of insulating and covering wire.

2322. R. Tidman, of Jermyn-st., engineer and builder. Improvements in machinery or apparatus for paying out and for raising electric telegraph cables.

2323. R. A. Brooman, of 166, Fleet-st., editor of the *Mechanics' Magazine* and patent agent. Improvements in the manufacture of small chains and links for the same. A communication from H. Jesson, of Paris.

2324. K. H. Cornish, of May-fair, surgeon. A new mode of advertising.

2325. W. E. Newton, of Chancery-lane. Improvements in apparatus for lighting gas and other lamps. A communication.

2326. A. W. Drayson, of Plumstead, Kent, captain R.A., and C. R. Binney, of Woolwich, captain R.E. Improvements in submarine telegraphic cables.

2327. J. Smith, of Newport, Salop, engineer. Improvements in rough-shoeing beasts of draught and burden.

Dated October 19, 1858.

2329. J. Whitworth, of Manchester, engineer. Improvements in guns, gun-carriages, and ammunition.

2331. J. Owen and H. Duckworth, of Blackburn, machinists. Improvements in looms.

2333. J. Richmond, engineer, of Bow. The construction of valves, applicable especially to water meters, and other instruments for measuring fluids, and all hydraulic purposes.

2335. W. E. Newton, of Chancery-lane. Improvements in the hanging and arranging of cylindrical, conical, or spiral steel railroad springs, for railway carriages. A communication.

2337. R. A. Brooman, of 166, Fleet-st., editor of the *Mechanics' Magazine* and patent agent. Improvements in propelling vessels. A communication from J. C. Meunier, of Paris.

2339. W. Riddle, of Barnsbury-park. Improvements in packing or forming merchandize or goods into bales.

PATENT APPLIED FOR WITH COMPLETE SPECIFICATION.

2352. E. B. Horn, of Massachusetts. An improved compensation apparatus for a hair-spring balance for a watch or time-piece. Dated 21st October, 1858.

NOTICES OF INTENTION TO PROCEED.

(From the "London Gazette," November 2nd 1858.)

1377. W. Blizzard. "Oils."

1407. W. and J. Galloway. "Treating dye woods," &c.

1415. T. Spencer. "Iron ores and ferruginous sands."

1433. C. Nightingale. "Curling and spinning machines."

1434. T. Booth. "Wheels and axles."

1439. P. M. Crane. "Fuel."

1440. T. Lemon. "Chain harrow."

1447. E. Pinchon and W. R. Harris. "Healds for looms."

1448. E. E. d'Heurle. "Boxes for tea," &c.

1451. I. Hammond. "Breech-loading guns."

1453. J. Luis. "Reaping machine." A communication.

1484. J. Morris. "Printing fabrics."

1486. E. Lord. "Looms."

1488. A. V. Newton. "Lamps." A communication.

1489. W. Sellers. "Turning metals."

1491. J. L. Clark. "Telegraph cables."

1493. T. Scott. "Dressing."

1507. R. A. Brooman. "Cast steel." A communication.

1510. T. Woolner. "Feeding boilers."

1511. M. Nelson. "Propellers."

1516. W. E. Newton. "Roller blinds." A communication.

1537. R. Smith. "Pipe tongs." A communication.

1539. S. Harrison. "Ovens."

1556. J. F. Watson and V. B. Fadeuilhe. "Cocoa and chocolate."

1573. J. J. Field. "Carrying telegraph wires."

1574. G. Buchanan. "Sugar-cane mills."

1580. W. Woodcock. "Warming air."

1649. J. W. Giles. "Traction engines."

1665. H. J. Giffard. "Feed apparatus for boilers."

1752. H. Greaves. "Streets, roads," &c.

1837. J. Fogg. "Pressure gauges."

1853. J. H. Johnson. "India rubber, gutta percha," &c.

1911. M. R. Pilon. "Fire-arms."

1928. J. Dredge. "Condensers; pumps."

2068. W. H. Manning. "Candlesticks."

2314. J. Milnes. "Weaving fabrics."
2333. E. R. Handcock. "Steam engines," &c.
2360. R. Cowen, jun. "Dressing fabrics."
2368. W. E. Newton. "Facilitating submarine explorations." A communication.
2372. W. Johnston and W. Ross. "Water-closets and valves."
2373. W. Smith. "Lithographing."
2384. J. Braby and J. Braby, jun. "Wheeled carriages."
2303. T. Moore. "Refrigerators."
2318. W. Clay. "Thrashing machines."
2337. R. A. Brooman. "Propelling." A communication.
2352. E. B. Horn. "Compensation apparatus for time-pieces."

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

2408. G. Riley.
2419. W. Naylor.
2427. H. E. Drayson.
2429. T. J. Swinburne.
2430. T. S. Grimwade.
2437. G. Milner.
2439. W. Taylor.
2442. A.E. L. Bellford.
2451. R. Cook.
2452. W. Staufen.
2470. G. Collier.

LIST OF SEALED PATENTS.

Sealed November 1st, 1858.

775. P. Brun.
976. R. Illingworth.
984. E. S. Trower.
989. J. and M. Swain.
996. C. D. Archibald.
1000. J. Lawson and T. Robinson.
1014. W. Clark.
1018. J. and J. G. Bunnett.
1019. C. J. Carr.
1029. R. Best.
1032. W. Clark.
1036. A. V. Newton.
1043. I. L. Bell.
1054. W. Pare.
1058. R. Halliwell.
1060. J. M. Gilbert.
1070. J. Sharples.
1082. H. Hyde.
1132. M. Henry.
1172. W. E. Newton.
1187. J. Stuart.
1200. T. Dunn and W. Irlam.
1204. J. F. Lackersteen.
1218. J. Schloss.
1300. E. T. Hughes.
1332. G. W. Hart.
1428. W. E. Newton.
1609. C. S. Putnam.
1702. W. A. Gilbee.
1735. J. Houston.
1836. G. Metzler and J. Waddell.
1894. H. Hood.
1934. J. Coates.
2038. J. G. Newberry.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions.

NOTICE TO CORRESPONDENTS.

Articles and Correspondence designed for insertion in the ensuing Numbers of the *Mechanics' Magazine* must reach the Office by the Tuesday of each week, at the latest. It is highly desirable that they should be forwarded earlier if possible.

CONTENTS OF THIS NUMBER.

LONDON: Printed and Published by Richard Archibald Brooman, of 166, Fleet-street in the City of London. Sold by A. and W. Galignani, Rue Vivienne, Paris; Hodges and Smith Dublin; W. C. Campbell and Co., Hamburgh.

Mechanics' Magazine.

No. 1840.] SATURDAY, NOVEMBER 13, 1858. [PRICE 3D.

Edited by R. A. Brooman and E. J. Reed, 166, Fleet-street, London, E.C.

PIRSSON'S PATENT SURFACE CONDENSERS.

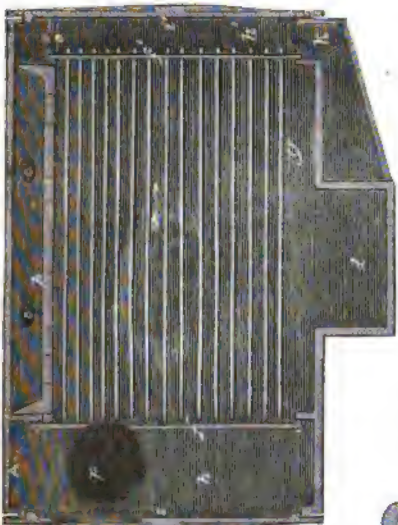


Fig. 2.

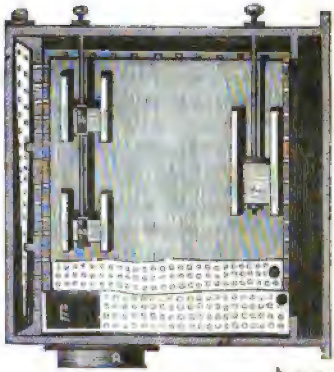


Fig. 4.

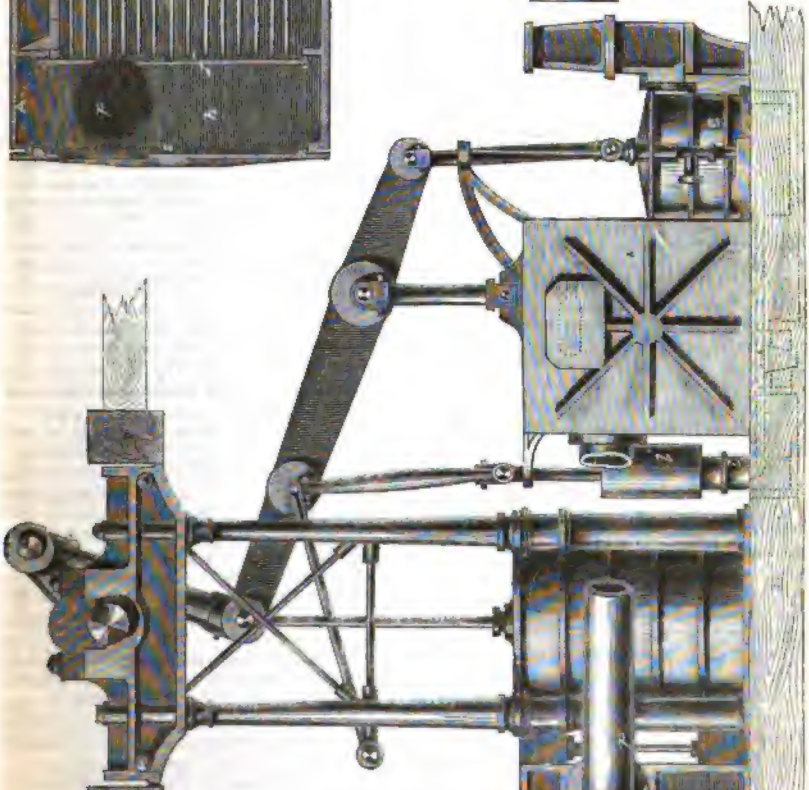


Fig. 1.

PIRSSON'S PATENT SURFACE CONDENSERS.

SURFACE condensation has lately made rapid and great advances in the estimation of engineers. In America the patent surface condensers of Mr. J. P. Pirsson, of New York, have been adopted with great success in very many of the largest and finest steamers. Until the introduction of Mr. Pirsson's improvements, the chief objection to the use of surface condensers was their want of durability, the evils of which more than counteracted their advantages. The principal causes of their rapid destruction—expansion and contraction combined with great pressure—have, however, been either eliminated or rendered harmless by Mr. Pirsson's invention. In this invention, moreover, provision is made for the immediate resort to the system of jet-condensation in the event of an accident or disarrangement occurring.

Mr. Pirsson's invention has been made the subject of a patent in this country, and we have reason to expect that its introduction here will shortly be facilitated by the presence of the inventor himself. The experience of its utility has been so large that we do not hesitate to speak unreservedly in its favour. The following is Mr. Pirsson's own description of the invention:—

This invention has for its object the supplying of boilers with pure water (for the generation of steam) by the method known as surface condensation. The novel features consist in so arranging and constructing condensers in steam engines that the two systems known as "jet" and as "surface condensers" may be worked in combination, so that in the event of the failure of the surface condenser the jet condenser will continue the operation, and thus secure under all circumstances the efficiency of the engine, this being a matter of the greatest importance, especially in the case of ocean steamers.

Fig. 1 (preceding page) represents a marine steam engine, showing a side elevation of the condenser. Fig. 2 is a longitudinal vertical section of the condenser alone. A is a case or air-tight vessel, made upon the principles of the usual jet condenser. It has a plate perforated with holes at *b*, near the top, upon which the condensing water is received or injected; and, in order to ensure that that water be evenly distributed over the whole surface, it is introduced by means of two or more cross jets by means of pipes, *c*, *c*, perforated with small holes, the quantity of water being governed by a stop-cock, as usual in ordinary jet condensers. At the bottom there is a channel way, *d*, leading to the air-pump, *e*, as shown. This latter is worked in any of the known methods, and discharges its water overboard as usual. Near the front and back ends there are two upright division plates *f*, and *f'*; these plates are perforated full of small holes, arranged, however, for system, in a regular series of rows. These holes are of such size as to take in the condenser tubes, and can be varied according to the design intended by the constructor to fill any particular space; it is, however, preferred that the tubes should be quite small, say not to exceed one inch in diameter. These plates have ther holes so as coincide generally, but the plate, *f'*, may be secured to the case, A, so that its holes will be at a little lower level than those in *f*, consequently the tubes when put into them will incline a little. The tubes are put in as follows: The two head plates, *i*, *i'*, being taken off the tubes, will be pushed through so as to enter the holes in each of the perforated plates. One end must now be fastened by riveting to one of the plates, leaving the other end loose or free to play a little. In the drawings the fastened ends are in the plate *f*, and the loose ones are shown as projecting through a little in the other plate. The object of leaving one end free is to permit play for expansion and contraction. By this arrangement, the case, A, becomes divided into three compartments; one at *h*, which is the steam exhaust compartment; the second at *g*, which is the condensing water compartment; and the third at *h'*, which is the reception compartment for the water resulting from the condensation of the steam. From this latter compartment there is a channel way at *k*, which leads to an air-pump, *l*, but of smaller capacity than the one heretofore named, and shown by the letter *e*. The air-pump *l* is to be worked by the engine in any proper manner. At *o* is a valve covering a passage from the compartment, *h*, to that of *g*, and there is likewise a communicating passage between the two channels, *d* and *k*, which may be opened or closed by a valve or cock, as seen in the dotted lines, fig. 1.

Attached to the air-pump, *l*, there is a reservoir, *l'*, to receive its discharge. From this reservoir a pipe leads to the feed pump or pumps of common construction. The operation is as follows:—The exhaust steam flows from the cylinder by the pipe, *p*, and is

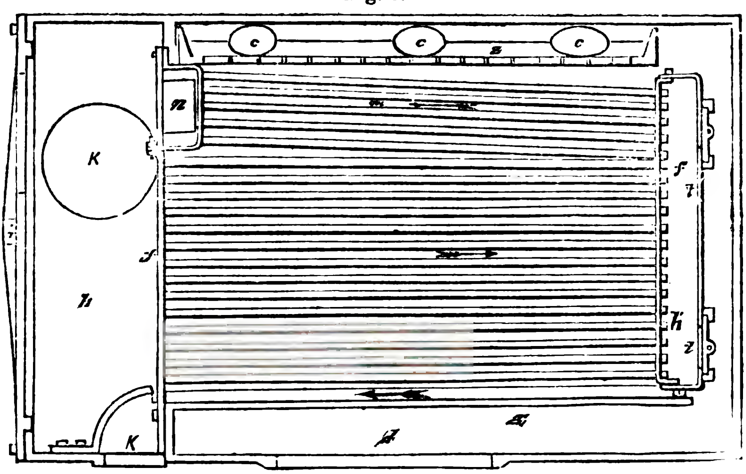
received into the compartment, *h*, of the condenser; cold water is then injected by the rose or perforated pipes, *c*, and flows over the whole of the plate, *b*, from which it falls in a shower upon the tubes of the surface condenser. The steam flowing through the said tubes is therein condensed by the cold surface, and the water resulting therefrom flows out at their opposite ends, and falls into the channel, *k*, whence it is pumped out by the air-pump, *l*. The water which flows in by the injection falls into the channel, *d*, and thence is pumped out by the greater air-pump, *e*. The action of these two pumps causesthe pumping out not only of the water but also of the air or other gases, and produces a vacuum more or less perfect, the pump *l* producing a vacuum in the space *h*, in the tubes, and in *h′*, and the pump, *e*, a vacuum in the compartment *g*.

It will be seen as a consequence of this action, that there can be no atmospheric pressure upon the surface condenser, as there is a like vacuum maintained on opposite sides, the whole of the atmospheric pressure being sustained by the case or jet condenser, A. Thus, in the event of any accident to the surface portion, the jet part remains intact and in complete working condition. Neither is it important that the joints of the surface condenser should be absolutely air or water tight, because, as the whole of the interior of A is exhausted of its air, leakings in the surface condenser are of no consequence, for there is nothing present to impair the vacuum. The absence of all pressure also allows of a thin metal being used in the surface condenser.

As the steam is received in a succession of puffs, which are condensed in like succession, there is of necessity a constant series of expansions and contractions taking place. These are provided for by leaving one end of the tube loose and free to play as already described, although, if it is preferred to make both ends fast, then the tube plate itself must be allowed to have slight play for the same purpose. It will now be seen that the water from the condensation of the steam is kept entirely separate from that which is used to condense it. Consequently any kind of impure water may be employed for the purpose, without risk of deteriorating the pure water of the steam, which is accordingly saved for again feeding into the boilers. The valve, *o*, is used for the purpose of insuring the equalization of the vacuum in case there should at any time be more steam in the tubes than could be condensed by them; the valve then being opened allows the excess to escape into the jet condenser, and to be condensed by direct contact with the injection water. It is also of service in connection with the cock, shown in dotted lines, to use the jet portion alone, when in case of any accident to the air-pump, *l*, such would be desirable. The opening of *h′* will let the fresh water flow into the channel of the great air-pump, while any condensed steam will flow into the jet portion through *o*.

In figs. 3 and 4 are views (on different scales) of the same condenser somewhat modified. It provides for a return section of tubes as seen at *m*, the equalizing aperture being placed in the chamber at the end of the return, as at *n*. The object of this is to

Fig. 3.



cause any steam which might have passed through the lower section, uncondensed, to return again through the upper section, the pipes of which are kept coldest, and thus

insure the complete condensation. In this plan also both ends of the tubes are made fast to their tube-sheets, but one tube-sheet, however, is made fast to the case, A, the other having the whole of the compartment, h', attached to it, and that sheet is thus left free to play. Another object for this is to allow of all the tubes being removed in a body; which is done by taking off the head-plate and drawing them out in a mass; or when there is not room in that direction the top of A may be made to come off, and thus the tubes be lifted out. In order that but one tube-plate be made fast the channel to the fresh-water air-pump is placed also in front, and a row of large tubes return the water from the compartment, h', as shown in fig. 4. In this plan the connecting passage between the two channels, k and d, is dispensed with, an equivalent being formed in the valve, t, while t' or n are equivalents for o, described in the former figure. Whenever it is required to use these valves, for the fresh water will then be lost, the water for the feed may be taken from the hot well of the large air-pump as usual.

Other modifications may be made which will be evident to any engineer without changing the character of the invention.

In the *Journal of the Franklin Institute* for October, 1858, a letter on the durability of the tubes used in the Pirsson condenser, written by Mr. Pirsson, is published. In it he says:—

"The question of the degree of wear in the surface portion of my condenser is reduced to that of the selection of the most durable material, and has nothing whatever to do with the principle. The copper tubes at present in the condensers of the *Arago* are now far in the fourth year of their existence, performing in every respect as well as at first. The same is the case in the *Fulton*, the sister vessel. A few days since, the tubes of the *Augusta's* condenser were examined and found to be in perfect order, after about four years' use. The United States steamship *San Jacinto*, having my condensers on board, has just returned from a three years' cruise, and on examination the tubes were found to be in perfect condition, not having in the meanwhile been touched. Mr. Prosser is amused at the idea of there being any advantage in tinning the tubes. On this head I am not committed one way or the other; and I will merely cite some facts as to the length of time the 'tin will remain.' I do this the more readily as it will serve to explain the reason why tinning was resorted to at all. At the first introduction of my condensers, I had the misfortune to have several sets of tubes made from Lake Superior copper; for experience was wholly wanting then as to what effect salt water would have upon this metal, as compared with other copper. It was soon found that it would not stand at all. The *Arago* had her *first set* of this copper, and it did not endure for even *two voyages*; and so too, with the *St. Louis*. These were replaced by *pure Spanish copper*, which has proved satisfactory in durability. Messrs. Merrick and Sons were the first to suggest tinning the tubes, with a view to prolonging their wear, and I believe first treated those in the *Quaker City* in that way, and other engineers have followed their example. Over four years ago I put into the *John L. Stevens*, 3,000 ton vessel, and *Sonora*, 2,400 tons, sets of condenser tubes of pure Spanish copper *untinned*. These, at late accounts, were still in good order. Whether the tinning is of any material value, I am unable to say; I have, however, been in favour of it. This fact has been proved beyond question, viz., that the condensation is not injuriously affected thereby; while, so far as my observation extends, the tin also adheres to the copper to the last. It is important, in an economical point of view, to select the purest kind of copper for the tubes. At the salt works at Salina, New York, the pans made of this Lake Superior copper have proved very inferior in durability to those of pure Spanish copper. As these questions are of interest not only to the engineer, but to all connected with ocean steam navigation, I will add that I have also tried brass for the tubes, both tinned and untinned. In the steamship *St. Louis*, as an experiment, one-half of the tubes were of Spanish copper and one-half of brass, both without being tinned. In the Collins steamship *Adriatic*, the tubes were of brass, tinned. Their durability in the latter vessel is of course yet to be determined. In the *St. Louis*, however, thus far, the wear appears to be equal; at least, none of the tubes have worn out, after a period of about four years."

THE ENLARGEMENT OF THE MECHANICS' MAGAZINE.—We are indebted to several esteemed correspondents for suggestions respecting the new title and improved form of our Magazine. Some object to the title—or, more properly, sub-title—which we have announced. We have well considered the subject, and at present see much reason for adhering to our own proposal. We shall still feel obliged, however, by any suggestions which our readers may kindly send us.

THE LIGHTING OF TOWNS BY GAS.

PADDON'S PATENT GAS REGULATORS.

The subject of public light is one of gradually increasing importance to gas companies and the community generally. When the old system of oil-lighting was first superseded by gas, the improvement was so great and satisfactory that no one cared to discover defects, and the total want of acquaintance with gas matters on the part of the parochial authorities, contributed to make them accept the arrangements of the gas companies without question. But the successive improvements made by the companies in the distribution as well as the manufacture of gas at length became apparent, and were viewed with interest by the various parishes. In the metropolis, to which we more particularly refer, great efforts were made to enlighten the minds as well as the localities of the vestries by competing gas companies, who, in advancing their respective claims to preference, soon placed their customers in a position to insist upon some very hard bargains in the way of contracts. Stipulations were made not only for a stated and definite minimum consumption per hour, but also for the exact quality of the gas; and, as the circumstances and abilities of the companies for supplying certain districts were not considered, the supply to the public lights was always made at a loss.

At present, however (we speak of London), a better state of things exists. While quantity and quality are guaranteed on one part, a fairer price is accorded on the other. But the matter has become one of great interest, for the colossal expenditure involved in the maintenance of over 50,000 lamps enlists all the economical considerations of the parochial boards, and this enormous demand for gas can only be met by the companies in connection with serious disadvantages.

For instance, it will at once occur to any person acquainted with the rapid increase of private lighting, that the mains must be continually becoming less adequate to the supply, and require to be from time to time enlarged. From the great cost involved, and other causes, this can only be done gradually and at intervals. Meanwhile, the increased demand is met by increasing the pressure. But the pressure, owing to the closing of large establishments, the length of mains, the difference in the levels of the districts, &c., cannot be so controlled at the works but that there is a variation during the hours of burning often amounting to 500 per cent. more than necessary, while the street lamps, being adjusted only at the lighting-up time, are exposed to the full effect of this variation on their consumption. The consequence is, that in all cases the amount consumed is more or less in excess of the amount contracted for, and the greatest possible reduction during the quiet hours fails to make up for the involuntary waste which occurs during the earlier hours of lighting. In the valuable and standard "Treatise on Coal Gas," by Mr. Clegg, he states that "in the street or public lamps THE LOSS IS ALWAYS CONSIDERABLE, even presuming the utmost care at the works."

Some idea of this loss may be acquired from the fact that if an ordinary burner, as used in street lamps, be adjusted so as to consume 5 feet per hour at 5-tenths of an inch pressure, the consumption will increase 1 foot per hour for every 3-tenths added to the pressure. As this unavoidable increase often extends to 50-tenths, the lamps are sometimes found consuming 20 feet per hour, and this would frequently be the case but for the adjustment being made at a certain state of pressure, whereby the evil is to a limited extent corrected.

Such being the case, several contrivances have been introduced for the purpose of regulating the pressure at the burner. They may be described as of two kinds. In one it is sought under various sizes and forms to alter the aperture through which the gas passes by a moveable body actuated by, and working in the stream of, the gas; and the other kind consists of adaptations of the well-known principle which employs the atmosphere as a constant, the *modus operandi* being in some cases with an inverted vessel working in a fluid medium, and in others with a flexible diaphragm.

In regulators of the first kind, the specific gravity of the moveable part (whether it be disc, ball, or any modification) is all that can be made available, and as the gas presses equally on every portion, it acts only at a given pressure. If, for instance, the check comes into operation at 10-tenths and suddenly reduces the pressure to 5-tenths the aperture remains the same for any pressure above 10-tenths whether it be 15, 30, or 50 tenths. The advantage is, therefore, inconsiderable where there is great variation.

Regulators of the second description are essentially different. The gas is admitted into an expanding and contracting chamber, the moveable surface of which is very much larger than the apertures forming the inlet and outlet. The difference between the atmospheric pressure on one side, and the gas pressure on the other, gives sufficient power to work a graduated valve which will diminish or increase the

flow of gas as the pressure varies, thereby maintaining uniformity of pressure at the burners under all circumstances. Such machines are now extensively and advantageously used at gas works and large establishments, but the great difficulty has been to reduce them to a size and cost suitable for street lamps. The usual modes of adjustment become so complicated in a small form that efficiency cannot be maintained; and there is also the obstacle of expense. In confirmation of this, is the fact that up to the present time the street lamps have been unregulated.

In a regulator for which a patent has just been completed by Mr. Paddon, of Foundling-terrace, Gray's-inn-road, London, the above defects have been avoided, and the long-proved advantages of the diaphragm governor (first patented in 1825) are made available for single burners. The usual auxiliaries of levers, cranks, springs, &c., are entirely discarded, and a novel simplicity of arrangement and action obtained, by employing magnetic attraction to effect the graduations of the valve.

He forms the valve of tempered

steel, converted into a magnet, as is well understood, and combines with it a case composed of soft iron; or he otherwise imparts an attraction to the valve or opens the inlet passage by magnetic influence. In the annexed engraving we have shown, partly in external elevation and partly in section, the manner in which he prefers to construct his regulator. A is the burner fixed in the conducting pipe, B. C, a case or shield. D, an inlet pipe. E, E, branch pipes for conveying the gas after passing through the regulator to the burner. F is a leather diaphragm to which is connected the adjustable weight or valve, G, formed wholly or partially of tempered steel, magnetized. H is the case or socket composed of soft iron, into the bottom of which the inlet pipe is made to screw.

The valve G, by its constant attraction downwards to the case H, is compelled to descend immediately the pressure of the gas inside the regulator is diminished, and the inlet passage is thus opened.

The manufacturers, Messrs. Paddon and Ford, adopt the rather unusual course of inviting by circular the most severe tests. They say, after excepting Argand's,* "Any other burner may be used consuming from one to ten feet per hour; and if fixed upon an experimental meter, with a gauge between the regulator and the burner, it will be found that the gauge will indicate the same, whatever may be the increase of pressure at the inlet. If also the consumption of any given burner be taken at six-tenths, it will be nearly or quite the same with any higher pressure up to one hundred-tenths."

The advantages resulting from the use of this regulator are, the maintenance of any required pressure and consumption at the burner; a saving of from 25 to 30 per cent. of the ordinary consumption, without diminishing the amount of light; a reduction of pressure in the mains, especially during the quiet hours of the night; a saving in the cost of repairing lamps, and a security against the uncertain adjustments of lamplighters, which, in so many instances, lead to disputes with parochial authorities.

The new regulator has been patented on the Continent, and is now in large demand by most gas companies, both here and abroad. From its successful operation and cheapness, its use will doubtless become very general, if not universal.

THE PAPER DUTY.—Is it not absurd that, while Government is enforced to spend vast sums in promoting popular education, it should not see the impolicy of inflicting heavy fines on those who are educating all classes of the people, free of charges to the State? Away with these restrictions on intellectual light and air, on speed, on discovery, on description. Let the Press declare against the wrong, and the wrong will have to cease.—*Athenæum.*

* As Argand burners do not require more than 1½-tenth pressure, it is necessary to specially construct regulators for them.

IMPORTANT IMPROVEMENTS IN THE MANUFACTURE OF STEEL.

We have recently received from our correspondent in New York, a letter stating that the Damascus Steel and Iron Company, of that city, were producing steel of every description and quality at prices very much below the current prices of the English and American markets. We have now before us a document emanating from the company, in which they state that they are enabled to make cast steel of the very best qualities, in any quantity, and invariably uniform in every respect. The following extract from the document sets forth their objects and professions as far as they have seen fit to publish them:—"By the old process, from fifteen to twenty days' time is required to convert iron into steel; and whether the steel produced be good or bad, depends more on the experience of the master and the practical skill of the workman, than on any well defined laws of science. The steel maker has, in the first place, to possess a very intimate knowledge of the exact intrinsic qualities of the iron he uses; he has to secure as complete and as equal a degree of carbonization as possible; he has to know that the steel he makes is equal in hardness, in which, without much practice, he may very easily be deceived; and finally, after all, he must examine its fracture by breaking off the end of each ingot, and then trust to his judgment to come to a conclusion whether or not proper care has been taken. It is owing to the absolute necessity for the constant exercise of all these requisites, that not unfrequently we find steel, from even the very best makers, not give satisfaction; and in all such cases, disappointments and losses of course ensue. Besides all the knowledge and care we have spoken of, the duties of a steel maker go yet a good deal further; he must adapt the capabilities of his steel to the wants and requirements of the consumer. There are a vast variety of defects in steel as usually manufactured, but there are a far greater number of instances in which steel is not adapted for the manufacture of the article for which it was expressly made. Cast steel may be manufactured for planing, boring, or turning tools; its defects may be, that the tools when made crack in the process of hardening, or that the tool while exceedingly strong in one part, will be found in another part utterly worthless. A vast nnmber and variety of other instances might also be cited, where cast steel is manufactured, even by skilful persons, and for want of a proper knowledge of the treatment the steel will receive after it leaves his control, it is found more or less unsuitable. The steel maker then, being required not only to attend to the intrinsic qualities of his steel, but also to trust to his judgment on so many points, particularly as regards the degree of hardness and tenacity which it should possess, so as to adapt it to the peculiar requisites of its employment, it is very evident that any system whereby some share of this responsibility might be transferred from the domain of chance and hap hazard, to that of science, would be most desirable. This change is precisely what is effected by the new process of steel manufacturing, as successfully carried out by the Damascus Steel and Iron Company. Under this process, although skill and practical experience in the workmen are always important qualifications, and will continue so to be under any system, yet all the essential processes and manipulations whereby any required quality or temper of steel, is designed to be produced, are taken out of his hands; and with them, all the risks of any failure in the results that might otherwise arise from either ignorance or carelessness. The new process combines in one operation, the thorough refining of the iron, and the imparting to it just the proportion of carbon required for any particular quality of steel. It will thus be seen that it surpasses the old, tedious, and expensive 'cementation process' with all its vexatious and uncertain results. The efficiency of the refining flux which is added to the metal, is sufficiently proved by the change that takes place in the iron when the carbonizing ingredients are altogether omitted. This change is manifested by a great increase in strength and tenacity, such as is unapproached by iron treated in any other way. This truly scientific and simple process is all that has to be gone through in converting the iron bar into the steel ingot. The after manipulations of reheating, hammering, &c., &c., are, of course, conducted in the usual way. It will thus be seen, that it is on the proper understanding of his business by the manager, and on that alone, the success of the whole manufacture hangs; and that it is not as by the old process left to the judgment of persons who may at any time ruin all, either by negligence, ignorance, or wilfulness. One of the main features to which it is especially designed to call attention, is that the quality of the steel to be produced is *known* to a certainty *before* the crucible is put into the furnace, and not, as in the old process, left to be *guessed* at by breaking off the end of the ingot when cast. This, it is believed, must commend the Damascus Company's product to every user of an article like steel, which to be of any

value at all, is required to be of exactly uniform quality. Any batch of steel found to answer particularly well in any manufacture, can thus be duplicated here to any extent, as all that is necessary, is that the manager should possess a proper understanding of the chemicals necessary to produce it. Since, after all, practical experience always furnishes the best and only reliable criterion whereby to judge of the merits of any article, and for the purpose of presenting what may partly serve as a substitute for personal investigation, and of overcoming prejudice by the weight of valuable authority, we hereto append the certificates of sundry persons largely engaged in the use of steel; some in public and others in private operations, all uniting in a commendation as hearty and unreserved, as it is gratifying; and we superadd the assurance, that in no instance, have we been met by adverse opinions from those who have tested this steel practically."

The Testimonials referred to at the close of this extract are strongly in favour of the Company's steel. A gentleman representing the Company—the patentee, indeed, of the improved mode of manufacture—is now in England; and from him we learn that sal-ammoniac and cyanogen are the principal materials used in his process. He is already in communication with some of the largest steel houses in Sheffield and other towns, and we hope before long to lay a more detailed and minute account of his improvements before our readers. If the results promised are attained, the entire steel trade will be, to a great extent, revolutionized.

IMPROVED PRINTING APPARATUS.

ON THE APPLICATION OF PASCAL'S LAW OF THE EQUAL PRESSURE OF FLUIDS IN ALL DIRECTIONS TO PRINTING PURPOSES.

BY MR. I. J. SILBERMANN, JUN., PUPIL AND ASSISTANT TO M. REGNAULT, AT THE COLLEGE OF FRANCE.*

A PRESS on this principle, and adapted to all kinds of printing, has been patented by Mr. I. Joseph Silbermann, jun., pupil and assistant in physics to the late M. Savart and to M. V. Regnault, at the College of France.

Pascal's law is this:—" Whatever be the amount of pressure brought to bear upon any point in a contained fluid mass (whether the fluid be a liquid, or steam, or gas), this pressure is distributed with perfect and entire equality among all parts of the mass, and consequently with perfect equality over all parts of the surface of the vessel which contains the mass," so that, if this vessel, or a portion of it, be pliable and elastic, it will communicate the same pressure which it receives to paper, cloth, or any other similar substance, laid upon an unyielding engraved surface; and the invention consists in printing by thus applying the pressure of a fluid to a yielding surface laid against an unyielding engraved surface, and this whether the surface printed be that of the vessel itself, which thus becomes the press, or whether it be communicated to another interposed yielding surface from the pliable and elastic side of the vessel, so as to print plane, curved, or angular surfaces—or whether the material to be printed be paper, felt, textile fabric, caoutchouc, leather, bladder, ceramic paste, or glass, crystal, or enamel softened by heat—or whether it be used for the purpose of peripheric printing, as in the printing of terrestrial and celestial globes, of vessels of glass or earthenware, or as a modification of the presses in use for other kinds of printing.

The application of this principle to the peripheric printing of globes, and of vessels of glass and earthenware, is the subject of a separate paper. At present let us consider merely its application to printing upon plane surfaces, as well as the different modifications which it admits of so as to suit the different kinds of printing, and lastly of its peculiar advantages over other methods.

As to the purposes to which this method of printing can be applied.—1. It is equally suitable to all kinds of ordinary printing, whether copper-plate, lithography, typography, paper hanging, or wood engravings, for it fully admits of the depth of shade in certain parts of the engraving being modified according to taste, without altering the engraving by the usual contrivance of folds of paper cut out so as to throw the part into suitable relief.

2. It is peculiarly suitable for polychromatic printing, whether typographic, lithographic, or copper-plate, and, the pressure being only in a vertical direction, the paper or cloth is not liable to be altered in size or form by the pressure, and admits of accurate fitting to the guide pins as often as the number of colours used may require.

3. It is equally suitable for printing upon all sorts of material, whether paper, cloth, ceramic plaster, felt, leather, or caoutchouc.

4. It prints with a single impression very much larger plates than it has heretofore been possible to do, and it insures the

* British Association, 1858.

colour being uniform over the whole surface.

5. It admits of being used for stereotype and other casts from ordinary printing type, and does not require that frequent touching with the brush which wears away the characters so quickly.

As to the pressure.—1. The pressure being that of a fluid, communicated through a uniformly yielding surface, will be absolutely equal at every point of the surface; consequently there will be no danger of partial pressure on the plate, nor need there be a pressure upon any part of the plate beyond merely what is necessary, so that the maximum result is thus obtainable with a minimum of pressure.

2. Any amount of pressure required can be easily obtained.

3. The amount of pressure can be ascertained with precision—for instance, by Bourdon's manometers, and diminished or increased to the exact extent which may be required.

4. Perfectly plane surfaces are no longer the only surfaces capable of being printed.

5. Convex or concave surfaces can thus be printed.

As to make, form, and size.—1. The press is extremely simple in its construction; almost all the pieces are cast exactly as they are used, and require very little fitting.

2. It can be made of any strength required.

3. It requires no troublesome alterations when the purpose for which it is used is altered.

4. It fits in a very small space, being only 4 or 5 inches wider than the printed sheet, whereas the presses hitherto in use are at least four times wider than the printed sheet.

5. It thus admits of being worked in a small and comparatively inexpensive office.

6. Its size being so small, a printer can have several presses, of different sizes, in the same office, so as to be no longer forced to use his large presses for small sheets.

7. It is very easily taken asunder and moved.

8. It is on this last account, and on account of the almost impossibility of breakage, admirably adapted for exportation.

As to its working.—1. It requires hardly any effort, and entirely dispenses with the severe labour which the winches and pedals of the present lithographic press require, with the rolling of copper-plate printing, with the difficulty of charging the blocks with colour, as well as with the danger of working the huge lever of the ordinary press in printing paper hangings, and as it requires less exertion on the part of the workmen it gives them more time to attend to the quality of their work, and thus tends to elevate their character.

2. A much greater number of impressions can be taken in a given time than was possible heretofore.

3. The manner of using the press can be learned in an hour.

4. No modification of the press or of any of its parts is necessary when a change is made in the size of the sheet, or otherwise in the nature of the work to be printed.

5. The impression is uniformly even and invariably successful.

6. There is no longer any danger of distorting or of lengthening by rolling out the plates in copper-plate printing, or of breaking the lithographic stones by the uneven pressure of the scraper.

7. The simplicity of the contrivance for locking the press, and for admitting and shutting off the pressure, renders all mistakes impossible.

8. There is no part of the press which is expensive in consequence of excessive wear and tear; and, even when completely worn out, both the caoutchouc and the metal have a considerable value as raw material.

As to the sort of pressure to be used.—Steam pressure may be adopted, or the pressure of expanded or of condensed air, the hydraulic press, the screw, the cam or eccentric, or knee lever lock.

If steam is used the waste heat will warm the plates in copper-plate engravings, and will thus get rid of the charcoal dust which is so injurious to the health of the workmen.

The *expenditure* of water or steam may be estimated by considering the surface of the caoutchouc as the surface of a piston, and its depression joined to that of the printed surface as the stroke of the piston; consequently, when the basin is one metre square there is an expenditure of one litre of air or water for each millimetre in the depression of the surface.

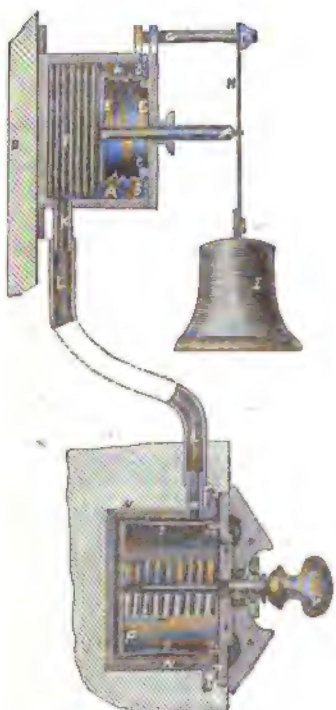
Water appears, on the whole, the most desirable agent, on account of its non-compressibility, and of the small quantity, required in order to produce very considerable pressure, as also on account of its non-expansibility, which prevents the possibility of an explosion, for if any breakage takes place the water simply runs out.

In experiments which were made with a pressure of from twenty to thirty atmospheres before perfecting the press, the vessel repeatedly burst, with no greater injury to us than a few splashes on our clothes.

Thanks to the unbounded kindness of Mr. Francis Chardon, the proprietor and director of one of the largest and most celebrated copper-plate printing establishments in Europe, an opportunity has been afforded of studying and practically testing the value of this invention, step by step, and in our numerous experiments he has often taken part in the actual working of the machine, as well as aided us by his suggestions.

WILLWAY'S PATENT APPARATUS FOR RINGING BELLS.

Mr. J. S. Willway, of Bristol, gas engineer, on Saturday last filed the final specification of his patent apparatus for ringing bells, which has many advantages belonging to it. The invention consists in causing a piston or rod to act either directly or through a wire or other connection upon a spring or band, from one end of



which a bell is suspended. The other end of the spring or band is fixed in any convenient manner. The piston or rod is acted upon by a cylinder of vulcanised india rubber, into which air is forced, or from which air is withdrawn through a pipe or tube, one end of which is connected to the cylinder and the other end to any apparatus suitable for compressing in or exhausting air from the pipe. Instead of a cylinder any other apparatus which can be expanded or compressed by the driving in or exhausting of air in order to obtain motion to impart a stroke to the piston or rod may be employed. The engraving annexed is a vertical section of an arrangement of apparatuses which Mr. Willway prefers to employ for ringing bells. According to his invention, A is a case which is firmly fixed to a wall or partition, B, as shown; or it may be placed on a stand or support in any other required position. The case A is closed by the plate C, and secured by screws passing through lugs, *a*, *a*, the washer, *b*, or making the connection perfectly air-tight. Through the centre of the plate C, a rod or spindle D passes and is connected to a piston or plunger, E, and this piston is joined by means of a cylinder, *k k*, of vulcanized india rubber or other suitable material to a flange, *c*, formed on the plate C; *d* is a hole in the plate C, for the admission and exit of air to and from the space enclosed by the vulcanised india rubber. F is a spring placed at the back of the piston which operates as hereafter explained. G is a rod passing through lugs formed on the plate C and case A, on the end of which rod a band or spring, H, is placed and kept there by the button, *e*. This band or spring, H, passes through a link or eye, *f*, on the end of the spindle, D, and has the bell, I, attached to the lower end of it. K is a nozzle in the case A, to which a tube, L, is attached, and, supposing this tube to be of any required length as indicated by the dotted lines, the opposite end is passed over the nozzle, M, formed in a case, N, which is inserted in a wall as shown in the drawing, provided the apparatus is being employed for communicating sound from room to room or between distant places. O is a plate or cover secured to the case, N, as in the former part of the description, by means of screws passing through lugs having a washer, *g*, to keep the parts air-tight. W is a hole in the plate O, for the admission and exit of air. P is the piston to which a rod, Q, is fixed, which rod passes through the centre of the plate O. *l* is the cylinder of vulcanized india rubber or other material joined to the piston, P, and flange, *m*, on the plate, O. S is an ornamental face plate which is held in position by the plate *h*. *i* is a tube which acts as

a guide to the rod Q, holds in position the plate *h*, and is screwed into the plate O. U is a handle or pull screwed on to the end of the rod Q, and T is a spring placed round the rod Q, as shown.

To use the apparatus, pull the handle U, and thus by means of the piston, P, cause the vulcanized india-rubber cylinder to collapse. Air will thus be drawn through the tube L, into the case N, forming a partial vacuum in the case A. The piston, E, is thus made to recede, and the cylinder, *k*, to distend itself by the pressure of air entering by the hole *d*. The piston, E, carries with it the rod or spindle, D, and thus communicates motion to the band or spring, H, and rings the bell, I. On releasing the handle, U, the springs F and T return the parts to their former positions.

SUBMARINE CABLE TO HANOVER.

During the past week Cromer has received an additional interest from the operations connected with the submersion of a telegraphic cable from the adjacent village of Weybourne to the island of Borkum, at the mouth of the Ems, and thence to Emden in Hanover.

This has been successfully accomplished by Messrs. Glass, Elliott, and Co., the eminent telegraphic contractors, on behalf of the Submarine Telegraph Company, to whom the lines from Dover to Calais, and from Dover to Ostend, belong.

On the morning of the 31st ult. the *William Cory*, a fine screw steamer carrying the cable, and fitted with the necessary appliances for its safe delivery into the sea, and the *Reliance*, a paddle-wheel steamer, accompanying her as an auxiliary in case of need, and to pilot the course, arrived off Cromer, and immediately proceeded to Weybourne, which had been selected for landing the end of the cable, on account of the deep water close to the shore, and the suitable character of the beach.

The work was immediately commenced under the direction of Mr. Canning and Mr. Clifford, engineers in the employ of Messrs, Glass, Elliott, and Co., the length of cable required to reach the shore being passed over a large sheave at the stern of the *William Cory*, and coiled into a lugger under her stern. Within an hour after the completion of the coil the end of the cable was landed at the coast guard house, in the presence of Sir James Carmichael, the chairman of the Company; Sir Charles Bright, engineer to the Magnetic Telegraph Company; Mr. Glass, Mr. Andrew, the Company's engineer; Mr. Ruyssenarcs; Mr. Elliott; Herr Frischell, the director-general of the Hanoverian Telegraphs; Mr. Upisher, of Sherringham Hall, and a numerous concourse of spectators.

The instruments were at once connected, and the insulation of the cable tested and found to be everything that could be desired, and at four o'clock the steamers weighed anchor and commenced paying out the cable. At half-past six they were out of sight; at twelve the next day 70 miles had been laid, and the whole distance to the island of Borkum, 210 miles, was laid by noon on the 2nd inst. The ships then proceeded up the river Ems, and on the morning of the 4th the operation was completed.

The cable which has been thus happily deposited in its submarine bed, is the largest of its kind which has ever been laid; all the previous cables, containing more than one wire, have been of very much shorter lengths, the long lines having been so far confined to cables having only one conductor.

As an instance of the rapidity with which such great undertakings can be completed by energetic contractors, it is worthy of note, that the Submarine Telegraph Company gave the contract to Messrs. Glass, Elliott, and Co. for this cable but two months since, and the energy which they must have devoted to the construction, shipment, and submersion of so long and heavy a cable within so short a space of time, will be well understood by any person who stoodon the deck of the *William Cory* when she was at anchor off Weybourne, and looked down the hatchways upon the vast mass of coiled wire in her hold.

The same steamer was employed by the same firm in the recent submersion of a cable of a very massive kind from Dunwich to Zandfort, for the Electric and International Telegraph Company.

The Magnetic Telegraph Company are rapidly pushing forward a line from London to Cromer, under the superintendence of Mr. T. Moseley, to work in direct circuit with the cable.

Preserving Iron Ships.—Mr. Daniel McCrae, of Greenock, has just patented the use of a greasy substance as a preventative coating for ships' bottoms and other exposed surfaces. "Bone grease" is preferred, that is to say, fibrine grease obtained from the cells of bones by boiling. Other greasy matters may be employed, such as that obtainable from "kitchen stuff;" but oils, tallows, and lard are not available. The grease may have "blue stone" or sulphate of copper mixed with it; or it may have various poisonous matters incorporated.

TALBOT'S NEW PHOTOGRAPHIC ENGRAVING PROCESS.

Mr. W. H. Fox Talbot, the well-known photographist, has just introduced a new process for engraving by means of light. The principal features of the invention are, first, the etching of a photographic image formed upon a surface of gelatine and bichromate of potash without first distributing that surface by washing it with water or alcohol; secondly, the laying of an aquatint ground of resin or copal upon a surface of gelatine, and not, as usual, upon the naked metallic surface of the plate; thirdly, after forming a photographic image on gelatine, the heating of it strongly over a spirit lamp, or otherwise; fourthly, the use of perchloride of iron as an etching liquid for the production of photographic engravings; fifthly, the use of the same substance as a substitute for aquafortis in common etching. A full description of the invention may be found in the *Photographic News* for October 22nd, or in the *Journal of the Society of Arts* for October 29th.

The *Photographic News*, in pointing out the prospective advantages of this new art of photography, says:—"It appears to us that the importance of Mr. Talbot's invention—which it is impossible to over-estimate—chiefly consists in its applicability to the engraving of plates for the illustrations of books, at such a low rate, that even the cheap publications which, with one or two exceptions, are now obliged to content themselves with engraved wood blocks, may, instead of these, give an engraving which will be mathematically correct as regards perspective and the scale of the objects represented. For the illustration of books of natural history of animals, as well as of flowers and plants, this invention is invaluable; and even the most minute microscopical animalculæ (such as the parasite of the parasite of the bee described in a recent number) can be reproduced by photography in the camera, and then transferred to a plate by this process, with the correctness no human hand could give. The paintings which form the pride of our National Gallery, the existence of which is unknown to the mass even of those who reside in this city, may be made familiar to the most remote peasant, by means of photographs engraved by this process. Surely, if the taste of the masses is to be raised by a contemplation of the beautiful, this invention offers the most ample means for accomplishing that object. Up to the present time the number of paintings which have been engraved has been very limited; this has arisen partly from the great expense of employing a good engraver, and partly from the limited sale of engravings, principally, we think, owing to the high prices it is customary to charge for them. In future, if Mr. Talbot's invention succeeds as well as we believe it will, there is no reason why every painting exhibited should not be engraved, and copies of it sold at such a price that the walls of the poorest cottage may be adorned with real works of art."

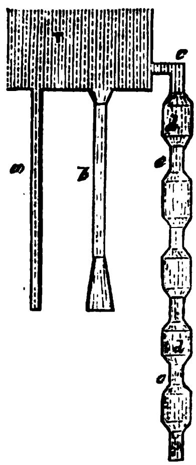
SHIPS' PUMPS.

To the Editors of the Mechanics' Magazine.

Gentlemen,—It is too bad of Mr. Roberts to speak of me in the way he does, after the pains I have taken to save him from any further useless expenditure of his money and time, by drawing, in the most forcible manner I could, his attention to those great and important facts in hydraulics with which he appears to have been totally unacquainted. To all who have to do with pump construction my last, and this present, letter will be found to contain hints of the greatest practical importance. Venturi, one of the ablest authors on the subject, says, in his experiments on the motion of fluids, "A right-lined tube may have its internal surface highly polished throughout its whole length; it may everywhere possess a diameter greater than the orifice to which it is applied; but, nevertheless, the expenditure will be greatly retarded, if the pipe should have enlarged parts, or swellings. This is a very interesting circumstance, *to which, perhaps, sufficient attention has not been paid in the construction of hydraulic machines.* It is not enough that elbows and contractions are avoided; for it may happen, by an intermediate enlargement, that the whole advantage may be lost, which may have been procured by the ingenious dispositions of the other parts of the machine." Here we have from a master an epitome of pump philosophy—*elbows*, *contractions*, and *swellings*. These are the things which have not had sufficient attention in the construction of hydraulic machines. In his very valuable work, the citizen Venturi shows the great importance of attending to the form and nature of the passages through which we may wish to convey, or force, a body of water. Venturi's VII. proposition is as follows:—"By means of proper adjutages applied to a given cylindric tube, it is possible to increase the expenditure of water through that tube in the proportion of twenty-four

to ten, the charge or height of the reservoir remaining the same."

By his 23rd experiment, Venturi shows that by one right-angled elbow the flow will be reduced from 70 to 45, and by his 24th experiment he shows that with five enlargements the flow is reduced from 240 to 109. In the figure, T is the tank, and *b* shows the pipe with adjutages mentioned in his VII. prop. *a* is a common straight pipe. *c* is the kind of elbow used in the 23rd exp., and *d*, *d* are the enlargement of the 24th exp. According to these experiments, if the flow through the pipe



b be taken at 1,000, the flow through *a* will be 417,—through the elbow *c* without the enlargements 268,—through the enlargements without the elbow 189, and through the elbow and enlargements together 122. Now, the pressures necessary to cause the water to flow at the same velocity, through all the pipes, will be inversely as the squares of these numbers. If the pressure per square inch on a piston forcing water through *b* be taken at 1 lb., *a* will require 6 lbs., *e* 14 lbs., *d*, *d* 28 lbs., and *c*, *d*, *d* 68 lbs.; *a*, *b*, *c*, and *e* having the same bore. This is a startling fact; 68 *times more pressure required to force water through c, d, e, than through b.* People dip their fingers into water, and think what an easy thing it is to move it. That distinguished engineer, Mr. W. Fairbairn, confessed, at the late Newcastle meeting of engineers, that he had been beaten in his endeavours to deal with it, and generously congratulated Mr. Armstrong on his great success. Mr. Fairbairn is a man of eminence in his profession, and could well afford to make such a confession before an assembly so well acquainted with the difficulties of dealing with water. It is only your small-beer interloper into the profession that sees no difficulties in the way. He makes no confessions of failure, nor sees any difficulties but what may be overcome by *indomitable perseverance.* Hint at them and be gets angry; prove that they are too great to be overcome, and he will abuse you, call you dishonourable, no gentleman, and tell you that you ought to be ashamed of yourself. This is the language Mr. Roberts uses towards me; language such as on the other side of the Atlantic would inevitably lead to what they there call a "difficulty." If it should lead to a "difficulty" I shall not be the challenging party, in order that I may have a choice of weapons; then I shall certainly not choose pistols, but pumps. We will give each other a teetotal drenching with cold water, until our seconds declare that enough has been done to wash out the stains from our sullied honour. I will take a Downton's pump with six men, and Mr. Roberts shall have one of his own with twelve men. I shall have one advantage over Mr. Roberts; as it has been proved that the agitation of water increases its temperature, and, therefore, it must be considerably warmed in passing through Mr. Roberts's pump.

My object being to call attention to such points as ought to be attended to in the construction of hydraulic machines rather than entering into a personal altercation, I proceed to notice another important feature in pump construction, and one that is not often thought of. When we consider that to overcome the *vis inertiæ*, and create a momentum in the water, which momentum is immediately destroyed again in an ordinary pump, and also in an extraordinary one like Mr. Roberts's; and further, when we take into account that the power thus destroyed is as the square of the velocity of the water, we shall see at once the importance of keeping the water moving as much as possible. Now in a Downton pump the water is always moving while the pump is at work. The foot valve never closes, and, therefore, while pumping is of no use whatever. I have seen a Downton pump worked without a foot valve, both in ordinary pumping and when used as a fire-engine. The foot valve is only useful to keep the water in the suction pipe when the pump stops. When working it is more injurious than useful.

No doubt, this constant moving of the water in the Downton, is a very important element in its great superiority over all other pumps. If it were desirable that ships' pumps should be portable, nothing

could be more portable than a Downton, if its barrel were screwed into the bottom flange, if easiness of removal and lightness of carriage have anything to do with portability. This slight change is not worth making. I never heard of a case where it was desired to remove one in a hurry; and as they are now, it may be done in a few minutes. So with respect to the turning a pump into a syphon: who ever heard of such a thing being urgently required? If it should, Downton's can be made, in five minutes, to act as a syphon down five pipes, and Roberts's only down two. Further, if those pipes be choked, the Downton can be made to force water down them and clear them, and Roberts's cannot—a thing of infinitely more importance than acting as a syphon merely. It would be idle to trace further a comparison between the two pumps. When attention is called to the prominent laws of the motion of fluids, and to the construction of the two pumps, any properly qualified person can see at a glance that the Downton's is as superior to the Roberts's as a locomotive to a wheelbarrow.

What an extraordinary idiosyncrasy is displayed by Mr. Roberts in challenging attention to that unfortunate paragraph in his long letter! Where another man would have expended his last farthing in buying up and burning every copy he could lay hands upon, Mr. Roberts calls attention to it for the sake of a pun. I admit it was not a bad pun, and, as he cannot enlighten us, I have no objection to his trying to enliven us. But I would not have been the author of all the puns in *Punch*, and at the same time the author of such a paragraph. And if I am a gentleman, I ought to be ashamed of myself for showing that the pretended experiments did not take place simply because it was impossible that they should. He is desirous of showing that Downton's pump was five per cent. worse than his, as regards loss, so he gives us the size of the tank and of the two pumps, tells us so many revolutions of each filled the tank, and shows that his had a loss of five per cent., and Downton's of ten per cent., and then concludes exultingly:—"Does Mr. Stone mean to tell us that one-fourth more water came out of his pump than it would contain?" But, alas for the veracity of Mr. Roberts! he had made a slight mistake in turning feet into inches. In finding the volume in cubic inches of a tank 4 ft. × 4 ft. × 3 ft., he makes a mistake of exactly 10,000 inches, and this mental mistake reveals a moral mistake on the part of Mr. Roberts. The purport of the paragraph is to show by experiment, that Downton's pump had a loss of ten per cent., and Roberts's only of five per cent. The dimensions of the two pumps are given, and we are told that one filled the tank with 80, and the other with 102·66: mark the ·66. Now, when we correct the mental error, the moral one is revealed to us. The tank could not by any possibility have been filled with less than 90·35 revolutions where Mr. Roberts says it was filled with 80, nor could 102·66 in the other case have filled it; and thus, this precious experiment turns out, as clear as the sun at noon-day, to be all bosh. It is not true, simply because it is impossible to be true. If we add 5 per cent., modestly claimed by Mr. Roberts for his pump, and 10 per cent., the amount he wished to foist on the other, for loss, then would he have got out of his pump, 19 per cent. in one case, and 25½ in the other, more than it could contain. Now, as Mr. Roberts finishes his precious paragraph by asking, "Does Mr. Stone mean to tell us that one-fourth more water came out of his pump than it could contain?" I cannot see anything particularly wrong in asking Mr. Roberts the same question that he put to Mr. Stone. Yet, for having done so, and thus exposed the attempt to make the public believe, by fictitious experiments, that Downton's pump lost twice as much as Roberts, I am called upon to be ashamed of myself, if I am a gentleman. Now I am candid enough to admit that one of us two, the one who wrote the paragraph or the one who exposed it, ought to be ashamed of ourselves, and if the public should determine that it is I, I will, most certainly, be most heartily ashamed of myself. I shall consider that henceforth people will not only doubt my figures, but what is of far, far more consequence, they will doubt my facts.

I perceive that there is some proposition to give cuts of the two pumps. Now, if you conceive the pumps to be completely filled with ice, and then the pumps removed in pieces and the ice left standing, and you were to give cuts of these in perspective, you would give something that would open eyes that are now shut, and make those now open, open still wider.

I am, Gentlemen, yours, &c.,

J. S. H.

PROFESSOR RANKINE ON PRACTICAL SCIENCE.—By an error, the conclusion of Professor Rankine's excellent paper on practical science was represented by a foot-note in our last Number as having been read at the British Association. By referring to the previous Number it will be seen that it was read at the Institution of Engineers in Scotland.

FIRE-PROOF IRON SHIPS.

Gentlemen,—The destruction of iron ships by fire with such melancholy results as have occurred of late lead me to expect in your excellent Magazine some suggestions from some of our engineers as to rendering iron ships fire-proof. Certainly this is worthy of their attention, and might be easily overcome. Iron ships are generally divided into water-tights to prevent their foundering at sea; why not protect them from the ravages of fire? Now, suppose the water-tight partitioning were made double, that is to say, ||6|| inches apart up to the deck, and the space filled with water when required, and a valve to allow steam to escape. No fire could hurt the other compartments through such a partition as this, with the roof part or deck plated over and then the deck planks laid down in the usual way. There might be a break in the planks across, above each partition. A few other matters would naturally suggest themselves in detail; a fire on deck could not burn down, and the deck planks having breaks across at regular distances could soon be removed if necessary. Some such arrangement as this I presume might insure great safety. If you think these suggestions might lead to any good, you will oblige by giving them a corner in your publication.

I am, Gentlemen, yours, &c.,

J. S.

Paddington, Nov. 8, 1858.

EXPLOSION OF GUNPOWDER BY IMPACT.

Gentlemen,—In the *United Service Magazine* for Oct. last, p. 277, is the following passage:—"There is no instance known of common gunpowder being kindled by a blow from a hammer on an anvil, or an analogous manner." About four or five years ago, when in Dublin, the idea was floating in my mind that gunpowder might be ignited by being placed on an anvil and struck with a heavy hammer. In order to test it, and set the matter at rest, I went to Mr. Kennan's machine factory, in Fishamble-street, and requested him to allow one of his men to make the experiment; he kindly and promptly did so, placing himself about half a drachm of sporting powder, which he took from a flask of his own, on the anvil. His man struck the powder first with a light hammer, the blow from which did not ignite the powder; he then placed the like quantity on the anvil, and the man struck it with a heavy hammer, when it exploded; this was repeated three or four times without failure. I reported this fact in some of the papers at the time, and lately, when I read the above passage in the *United Service Magazine*, I was determined to reassure myself of the truth of what I had asserted publicly, and went to the Bandon terminus here and requested Mr. Barber, the sub-engineer, to try the experiment. I placed, as before, half a drachm of sporting powder, it was Hall's rifle powder, on the anvil; Mr. Barber struck it himself with a heavy hammer, when it exploded with a sharp report. I mention these facts, because the idea that gunpowder cannot be ignited by such means, or accidental means similar to it, being promulgated and prestiged through the columns of the *United Service Magazine*, might lead to the most disastrous consequence, such as the blowing up of artificial firework storehouses.

I am, Gentlemen, yours, &c.,

J. Norton.

STREET ECONOMICS.

Gentlemen,—The want of a universal system of house numbering is a great evil and source of public annoyance, as well as entailing extra labour and increase of work-hours to many a poor under-servant in various branches of employment and trade. The following suggestions would probably remedy several gross deficiencies, and are therefore submitted to the attention of the public. Houses in very many parts of London present a most anomalous confusion, the same numbers being often repeated several times in a street numbering, it may be, only a few houses in extent: thus we may see two or three numbered 1, 2, 3, or any other figures, in a street having perhaps some twenty houses therein. This caprice is owing chiefly to tenants who have been long resident, and carry on an extensive business, who desire to retain the number the house had given to it at a period when but a very few houses existed in that street. In some streets a system has been adopted of numbering one side with odd numbers, and the opposite one with even numbers. Were this universally employed it might be a convenience, but being only partially employed it probably increases the mystification; yet the old plan can scarcely be improved upon, of beginning one side of a street with No. 1, and going on with successive numbers to the end, and then continuing with the first house opposite the chain of numbers, and so on to the other end. Many houses are without numbers to the doors, sometimes several are so in succession, or they are so

dim by age or from bad colours as to be imperceptible except by a close scrutiny. House-doors are generally painted in dark colours, and gold or yellow paint used for the numbers, sometimes brass; white would probably be the best to employ for figures, as it would retain its visibility longer than the others. Shopkeepers might with good effect or utility have their numbers painted on their gas globes within the shop-window, or upon the latter even, so as to be readily seen at night (but this suggestion might seem to uphold *late closing*, a system utterly indefensible) where the necessity for keeping open at night may exist. The names of streets should also be painted upon the glass frames of the gas lamps, and also an indication how the numbers run, especially in bye-streets, as thus—R, for right, Nos. 1 to 50; L, for left, Nos. 51 to 100, and so on. The names of our streets are generally—and especially in old streets—very defective, and *are often invisible*, even in broad daylight. The painting of these ought to be renewed at *stated* necessary intervals of time, and fines made upon parishes not attending to the same. Another useful alteration, alleviating the toilsome labours of postmen, would be to compel builders in future, and all proprietors of houses already built, to have letter-boxes made to the doors of every building used either for dwelling in or as places for the transaction of actual business between individuals.

I am, Gentlemen, yours, &c.,
"A VULGARIAN."

October 25th, 1858.

EDWARDS'S PATENT CORNUCOPIAN FEEDERS, AIR STOPPERS, VENT PEGS, &c.

To the Editors of the Mechanics' Magazine.

GENTLEMEN, — Referring to the notice in your Magazine for Oct. 23 of my patented inventions, there appears an error in stating that the vent pegs are "entirely formed of india rubber," whereas these, as also the spring air stoppers, are constructed of *india rubber and wood* (but no metallic material) and therefore are anti-corrosive.

With reference to the last paragraph in your notice, as to my inventions being simple and of great utility, and "that some persons not very scrupulous have imitated the same," I regret to confirm this dishonourable fact. A person named James Knott, then of Lambeth, glass maker, having been employed by me to manufacture my patent cornucopian feeders, and being furnished with sample patterns, made a few, for which I paid him. I also ordered a further quantity, when he asked for time to execute my orders, and in the meantime manufactured what I cannot help considering a spurious imitation of my invention, and put the words "James Knott's Patent" on the same, although he had not obtained even provisional protection. Some of his bottles so marked were purchased at various chemists' for the purposes of legal proceedings, and it appears James Knott subsequently applied for a patent, which is, I presume, invalidated by sale of the article prior to application for patent being made for the same. This should be a caution to inventors and patentees as to whom they entrust with patterns, or employ to manufacture their patented articles. I have the gratification to state that my Patent Cornucopian Feeders, &c., are highly approved of by the medical profession, mothers, nurses, &c. A most favourable notice has appeared in the *Lancet* medical journal, and from the interest you have evinced in my patent feeders, &c., I will do myself the pleasure of forwarding a few of the testimonials to hand.

I am, Gentlemen, yours, &c.,
HENRY EDWARDS,
Sole Inventor and Patentee.

1, Bishopsgate-street Within,
October 26, 1858.

[The testimonials forwarded by our correspondent speak very strongly in favour of the new feeder, which has already proved a great boon to infants and invalids, and is we consider constructed on the most simple principle and in the most efficacious manner possible.—EDS. M. M.]

THE SLIDE RULE.

GENTLEMEN,—I should feel much obliged if some of your correspondents would tell me the *principle* of the graduation of lines A and B in the engineer's sliding rule. By devoting a couple of lines of the *Mechanics' Magazine* to the required explanation you will greatly oblige.

I am, Gentlemen, yours, &c.,
ENQUIRER.

U. U. C., 28th Oct.

THE COLARY STICK OF THE GENUS BOOMARANG.

GENTLEMEN,—When on duty at Sydney, New South Wales, in the year 1815, I became acquainted with the extaordinary evolutions of the boomarang when thrown by the well-practised natives. In the year 1816, when stationed in the fort of Vellore, South India, I saw a native from the Colar province or district, throw his colary stick at a tuft of grass, distant from him about sixty or seventy yards, which, rapidly revolving horizontally on its flat side, struck

the tuft and cut it nearly through. The natives use these projectiles in war and the chase, and are said to be able to kill a bird on the wing, or a hare running at full speed. Specimens of these instruments are to be seen in the Museum of the United Service Institution.

The broad upper one is similar to that I saw at Vellore, the two under, being of less width, resemble those found in the ancient tombs of Egypt.

I am, Gentlemen, yours, &c.,
J. Norton.

FORMING AND LAYING SUBMARINE TELEGRAPH CABLES.

Gentlemen,—In your Magazine of Oct. 9th, there is a description of a machine (condensed from a paper read by myself at the British Association) which is peculiarly applicable to manufacturing submarine telegraph cables on board a ship, as suggested by your correspondent "J. M." in last Saturday's Magazine. Cables are made by this machine under a pressure of 10 to 12 tons on every inch, thereby preventing the possibility of the insulating material separating. Great strength and solidity are obtained by the powerful rolling action of the machine and by incorporating fibres in the outer coating of the insulating material, producing a body of such consistency and power of resistance to the alteration of form that the insulating materials do not of themselves possess.

The cables may be vulcanized by the cold process, which hardens the surface and thoroughly closes up the pores, and prevents the decomposition of india rubber or gutta percha and they may be made, tested, and delivered into the sea in one operation, at the rate of five or six miles per hour, rendering the joining of a number of short lengths unnecessary, and thereby avoiding the risk of imperfect continuity and producing a uniformly strong and continuous line of submarine communication.

I am, Gentlemen, yours, &c.,
J. Macintosh.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

Webster, J. *Certain new or improved metallic alloys.* Dated Mar. 18, 1858. (No. 553.)

No. 1 alloy consists of 3 parts nickel, 6 of copper, 12 of tin, and 1 of antimony. No. 2 of 2 parts of No. 1, and 20 tin and antimony. No. 3 of 20 parts copper, 20 zinc, and 1¼ parts of No. 1; or, of 21 parts copper, 15 zinc, and 1¼ of No. 1. In fusing the ingredients a peculiar furnace is used. No. 1 may be used for reflectors, &c. No. 2 for the manufacture of articles usually made of German silver. Or No. 2 alloy may be alloyed with lead for the production of a cheap white alloy to be used for Britannia metal. No. 3, or the modification of it, may be employed for bearings of shafts and axles, slide valves, and other parts of engine work subjected to great wear, as well as for general casting where a hard white metal is required.

Brocklebank, H. *Improvements in chronometers, watches, and time-keepers.* Dated Mar. 19, 1858. (No. 564.)

The patentee constructs the detent spring of a chronometer, &c., of a curved form, and makes the passing or relieving spring of round or flat wire. He places the stop pin in the detent in a horizontal position. The balance arbor has one roller or disc, in the side of which a jewelled pallet is fixed, and which also carries a pin for lifting the detent. He places a centre seconds' hand below or behind the hour and minute hands, and mounts it on a tube or collar which turns loose upon the boss of the hour-wheel. It has a wheel attached to it, driven by an intermediate pinion receiving its motion from an extra fourth wheel, or a wheel carrying a pinion driven by the third wheel. This intermediate pinion also drives another wheel carried by a lever or sliding plate, which wheel carries an independent seconds' hand, which can be stopped by moving the lever or slide without stopping the watch, and again started when required.

Scott, G. *Improvements in generating elastic fluids, and in apparatus for that purpose.* Dated Mar. 19, 1858. (No. 565.)

The patentee introduces common air or elastic fluids commingled with water in a state of spray into coils, or vessels heated by fire. The combination produces an elastic fluid of great expansive force.

Rhodes, W. H. *Improvements in speed indicators and calculators.* Dated Mar. 19, 1858. (No. 567.)

This consists, 1st. Of apparatus particularly adapted for ascertaining the velocity of mule spindles. The patentee causes the spindle to turn a worm working in a toothed wheel, to give motion by other toothed wheels and pinions to hands in connection with a dial. 2nd. Of proportional compasses, the arms of which have slides connected by an universal joint and right and left handed screws, so that the points can be adjusted to any required scale.

Williams, G., and E. Rowley. *An improvement or improvements in piling iron.* Dated Mar. 19, 1858. (No. 568.)

This consists in making box piles by causing the side plates of the piles to engage in grooves or troughs in the bottom or top and bottom plates of the piles; also in modifications which cannot be described without engravings.

Medwin, T. C. *Certain improvements in the construction of water gauges for steam boilers.* Dated Mar. 19, 1858. (No. 569.)

This cannot be described without engravings.

May, J. M. *Improvements in fastenings for porte-monnaies, travelling bags, ladies' companions, cigar, writing, and instrument cases, fusee boxes, and other like cases or receptacles.* (A communication.) Dated Mar. 19, 1858. (No. 570.)

On one side of a porte-monnaie, &c., is fitted a pin or bolt, which, when released to the action of a spring, is shot into and kept in a recess on the other side of the case, which it thus fastens, while, to open it, the bolt or pin must be pulled back The bolt, before entering the opposite tube, may likewise travel on its own side in a recess (also containing the spring).

Evans, D. *An improvement in apparatus for supplying air in streams to furnaces.* Dated Mar. 19, 1858. (No. 571.)

This consists in supplying air through perforated tubes surrounded by water, introduced and used in parts of furnaces which are very highly heated. When desired, heated steam may be passed through ome of the perforated tubes.

Young, J. *Improvements in chronometers, clocks, and watches.* Dated Mar. 19, 1858. (No. 573.)

These consist, 1st. In the application of a ratchet wheel, click, or pawl and spring to the pivot of the fusee of watches, &c., and the barrel or its axis of clocks, &c., to give facility for detaching and replacing the movements or parts. 2nd. In a peculiar pallet fork or lever escapement by which the locking or the getting out of action of the escapement is prevented. The invention cannot be described without engravings.

Bramwell, J. *Improvements in apparatus for the prevention of accidents arising from the escape of gas.* Dated Mar. 19, 1858. (No. 574.)

This consists in adapting to gas burners apparatus which causes the supply to be shut off upon a diminution of heat taking place. The patentee causes metal, &c., to be heated by the combustion of the gas, and during that heated state the expansion of the metal causes a valve or cock to continue open, but upon a contraction thereof, owing to decreased temperature, the valve or cock will become closed.

Cowell, L. *Improvements in machinery or apparatus for teaching the art of swimming.* Dated Mar. 20, 1858. (No. 579.)

The documents could not be inspected when we applied, the Lord Chancellor having extended the time allowed for filing the final specification.

Brooks, J. *Improvements in drawing frames, used in the manufacture of cotton and other fibrous materials.* Dated Mar. 20, 1858. (No. 580.)

This consists in placing a peculiar catch box upon the revolving shaft which carries the spiders, for stopping the machine when any of the slivers break.

Mills, R. *Improvements in washing machines.* Dated Mar. 20, 1858. (No. 581.)

The patentee places within a tub two discs held asunder by bars. He places between the discs rollers with undulating surfaces, near the outer edges of the discs, at such a distance asunder as to allow the water free ingress and egress. The clothes are placed in the interior of a cage, which, having an oscillating motion given to it, brings the rollers and water into contact with the clothes, and effects the washing. There are modifications included.

Biggs, J. and W. *An improvement in the manufacture of polkas when looped or elastic fabrics are used.* Dated Mar. 20, 1858. (No. 583.)

This consists in making the body of a polka of looped elastic fabric consisting of dyed or white yarn, and the border of printed looped elastic fabric.

Franc, J. Le. *Improvements in pressure gauges.* (A communication.) Dated Mar. 20, 1858. (No. 585.)

Here a vessel partly filled with quicksilver is used, in which there is a float, and to which is attached a rod which passes through the cover of the vessel, and is connected with another rod, which at its upper end is formed with teeth which give motion to a toothed wheel on the axis of a pointer, which indicates, on a circular graduated dial, the degree of pressure the apparatus is at any time subjected to. The float is actuated by a lever, so as to press it into the quicksilver. The lever is pressed in by a piston, which receives the pressure to which the apparatus is subjected.

Newton, A. V. *Improvements in sewing machines.* (A communication.) Dated Mar. 20, 1858. (No. 586.)

This relates, 1. To sewing machines in which a needle with an eye near the point is used to carry a thread through the cloth, whether one thread only be used, or whether a second thread be used and interlaced with the first by a shuttle, &c. It consists in the use of a pair of elastic nippers applied on the opposite side of the cloth to that on which the needle enters it. They seize the thread as it is protruded through the cloth, and draw it away from the needle, so as to leave room for the passage between it and the needle of the looper, shuttle, &c. Also in a looper having an eye near the point to sew with a single thread the chain or tambour stitch.

Newton, W. E. *An improved mode of treating and combining various combustible matters or substances for the production of artificial fuel.* (A communication.) Dated Mar. 20, 1858. (No. 587.)

This consists in producing artificial fuel by incorporating coal dust or small coal, peat, turf, or lignite, &c., with resinous, bituminous, or carbonaceous matters, and causing steam, hot air, or gases to pass through the mass during the stirring, or while the carbonaceous and bituminous particles are in motion; also in mixing pulverised carbonaceous matters with melted pitch, tar, or other bituminous substances worked up into a frothy state.

Pitman, J. T. *Improvements in the manufacture of soap, and in the apparatus connected therewith.* (A communication.) Dated Mar. 20, 1858. (No. 588.)

This consists—1. In the saponification of red oil, or red acid oil, and fat acids generally, by means of powdered or dry carbonates of soda, as barilla, kelp, trona, sal soda, soda ash, bicarbonate of soda, &c., and converting them into toilet and laundry soaps. 2. The combination of a hollow shaft and tubular arms as a mixing, stirring, and heating twirl for dry steam, either in open or closed vessels.

Manwaring, E. J. *Improvements applicable to stereoscopic views and pictures.* (A communication.) Dated Mar. 22, 1858. (No. 591.)

This consists in the application to the stereoscope of a system of rollers whereby views placed upon flexible material may be wound, unwound, and rewound upon or from such rollers, so as to be brought up to and taken away from sight.

Thomas, J. *Improvements in machinery for counting and registering or paging.* Dated Mar. 22, 1858. (No. 592.)

The patentee claims, 1. Attaching the units wheel to an axis of its own with which it revolves. 2. Driving each separate numerating wheel directly by a pawl of its own used in connection with raised flanges. 3. The use of rims in connection with numerating wheels and pawls, for keeping the pawls or clicks out of work until they are required to act. 4. The use of pins and notches for the pawls to support each other. 5. The use of pins and notches in combination with rims or flanges for supporting the pawls. 6. The general combination of parts for counting, &c. 7. The combination (with reference to the printing machine) of three ratchet wheels on one axle, for the purposes described. 8. The combination of ratchet wheels, guiding washers, and spring pawls or clicks, for actuating the wheels of paging or other counting machines. 9. The entire combination of parts as described.

Davies, G. *Improvements in the metallization of objects for the electrotype or galvano-plastic process.* (A communication.) Dated Mar. 20, 1858. (No. 594.)

The object of this invention is—1. That the objects may be rendered impermeable by a coating of drying oil, varnish, wax, gelatine, or stearine, which is allowed to dry. After this operation the parts to be submitted to the electrotype process are to be coated with a certain mixture. Before this coating is quite dry, very thin metallic foil or leaf is to be applied by a dabber or badger brush, and all the loose particles brushed off. The object, thus perfectly coated, is washed in water slightly impregnated with cyanide of potassium, and then plunged into a cold alkaline bath, which covers the metallised object with a thin film, which gives it a greater affinity for the electro-metallic coating. The object is then connected with the battery, and plunged into a bath of sulphate of copper, and left until the coating is sufficiently thick.

Lester, A. *Improvements in weaving ribbons, fringes, trimmings, and other narrow fabrics.* Dated Mar. 22, 1858. (No. 596.)

This relates chiefly to those fabrics in which two

or more different colours are combined in one, and mainly consists in forming sheds from both the warps, at the same time, and throwing both the shuttles simultaneously through such sheds. There are various modifications included.

HOLDEN, I., and E. HUBNER. *Improvements in preparing, heckling, or combing flax, silk, wool, and other fibres.* Dated Mar. 22, 1858. (No. 597.)

This relates particularly to the use of two pairs of continuously operating and moving nipping surfaces, between which the fibres are received in tines at right angles and continuously moved forwards.

MULLER, H. L. *Improvements in chromographic printing.* Dated Mar. 23, 1858. (No. 600.)

This allows of printing any number of colours at at a time. Each of the pigments is reduced to powder, and mixed with a solution of gum and water, &c., to bring the pigments to a thick paste, from which are then made sticks or types, the crosscut of each stick or type having to correspond with the surface of that part of the design of which the same is to give an impression.

ROWBOTTOM, J., and T. STANDEVEN. *Improvements in washing, wringing, and mangling machines.* Dated Mar. 23, 1858. (No. 604.)

This consists in the use of two discs of wood, &c., corrugated on their broad face, which are placed in a vessel with their corrugated surfaces towards each other at a distance apart, such discs having a reciprocating and a partially rotary motion given to them in a contrary direction to each other. A combined rubbing and squeezing operation is thus produced upon the fabrics to be washed.

WILEY, W. E. *Improvements in ever-pointed pencils.* Dated Mar. 23, 1858. (No. 605.)

When it is desired that there should be provision for receiving several lengths of lead and yet admit of the protruding part being drawn back, the lengths of marking material are placed within a tube, the edges of which are not fixed to each other, but spring together and embrace the marking material so as to allow a forcer to be forced along between the edges and force out the marking material. This spring tube is contained within an outer tube, so that it may be moved longitudinally a short distance within it, that so much of the marking material as is protruding beyond the point, may be drawn back within the nozzle of the outer case by moving back the spring tube. There are modifications included.

CLIFFORD, C. *Improvements in ships' davits, and in apparatus for stowing, lowering, and securing boats.* Dated Mar. 23, 1858. (No. 606.)

Here, for raising and lowering boats, a single davit having two heads is used. This davit consists of an upright pillar carried by bearings at the ship's side, and furnished with two arms, which, as they spring from the pillar, make an obtuse angle one with the other. The arms at their ends are fitted up like ordinary davit heads, and are stiffened by ties running to the top of the central pillar. By using a davit of this construction a boat may be turned from outboard inboard, and *vice versâ*, simply by causing the pillar of the davit to make a semi-rotation in its bearings.

COULON, E. *Improvements in preventing the incrustation of steam boilers.* (A communication.) Dated Mar. 23, 1858. (No. 607.)

Here a quantity of the plombates and plombites of potash and soda, the insoluble salts of lead, and chloride of zinc, is either placed in the reservoir of water from which the boiler is supplied, or is added from time to time to the water in the boiler. A quantity of sand, clay, red ochre, and muriatic acid is by preference added.

QUINTIN, C. F. *A kneading machine.* Dated Mar. 23, 1858. (No. 610.)

The patentee makes use of arms attached to, and capable of being caused to revolve with, an axis or axes passing through, or partially through, a trough containing the ingredients to be operated upon.

WILSON, J. C. *An improved method for introducing elastic substances into articles of wearing apparel, and the adaptation thereof to the manufacture of certain useful garments in which elasticity is required.* Dated Mar. 24, 1858. (No. 612.)

This consists in the use of india rubber, &c., in ladies' riding habits, house jackets, outdoor jackets, jacket cloaks, spencers, bodices of dresses, gentlemen's coats, &c.

GERNER, H. *Improvements in apparatus for the manufacture of gas from oils or fatty or resinous matters.* Dated Mar. 24, 1858. (No. 614.)

The patentee constructs a retort with a flue extending from the centre of the base upwards, and at the sides of the retort places pipes forming flues leading through the retort into the central flue. The top of the retort is separate and fits into a space containing fusible metal. The retort is supported on bricks or fire-clay. The oil or other matter is supplied through feed tubes arranged in a peculiar way. The vapour or gas of the oil rises from the heated base of the retort through red-hot scrap iron, earthenware, or other material supported on a grate, and thence passes through the condenser into the gasometer. Two pipes cast with the retort, and protruding through the brickwork, form manholes (when their covers are removed) for clearing the retort through.

CHEVALLIER, C., M. I. OLIVIER, and E. ROLLAND. *A machine for making and applying as soles to shoes and boots gutta percha, caoutchouc, and other analogous substances adapted for that purpose.* Dated Mar. 24, 1858. (No. 615.)

This relates to a machine composed of a mould and a roller. The mould is of two parts fitted to each other, and into it is placed the "last" with the "upper" of the boot or shoe. The substance employed for the sole is made soft, then placed on the surface of the last, and the mould passed under a curved pressure roller. During this operation the mould is held and guided by rollers between which the edges of the mould fit. The machine is worked by spur-wheels, and the pressure regulated by screws.

MENNONS, M. A. F. *Certain improvements in the construction of heating apparatus.* (A communication.) Dated Mar. 24, 1858. (No. 616.)

Here, the frame which closes the lower part of the double case-heating apparatus is replaced by a prolongation of the sheet metal forming the interior of the case, bent over towards the exterior of the casing to which it is riveted, the joint being thus placed beyond the action of the fire, and free from injury. The inner capacity of the casing being enlarged the increasing volume of water contained in it also affords more efficient protection to the body of the apparatus than was attainable hitherto.

KOTTULA, C. N. *Improvements in purifying soda leys, whereby they are rendered capable of saponifying all fatty matters or resins used in the manufacture of soap.* Dated Mar. 24, 1858. (No. 617.)

This invention consists in adding alum to soda leys, for the purpose of producing purified leys, which are capable of saponifying all fatty matters and resins used for soap making at one operation.

KOTTULA, C. N. *Improvements in the manufacture of compact neutral soap.* Dated Mar. 24, 1858. (No. 618.)

This invention consists in combining fatty matters with concentrated soda leys and lime liquor for producing quickly cheap neutral soap. The patentee makes the leys strong and highly concentrated, and purifies them with alum.

KOTTULA, C. N. *An improvement in the manufacture of neutral hand or skin soap.* Dated Mar 24, 1858. (No. 619.)

This invention consists in mixing fatty matter with concentrated soda leys, which the patentee purifies with alum and sal-ammoniac for producing neutral soap.

BIDDELL, G. A., and W. BALK. *Improvements in steam boilers.* Dated Mar. 24, 1858. (No. 620.)

This consists in so forming the connections of the

fire-box and back tube plate with the shell of the boiler, that they can readily be disconnected, the fastenings consisting of bolts, screws, or cotters, instead of rivets, so that the fire-box and tubes being connected together can be entirely removed from the shell when desired.

BRINJES, J. F., jun., and H. J. COLLINS. *Improvements in the manufacture and reburning of animal charcoal.* Dated Mar. 24, 1858. (No. 621.)

Here the retorts are placed horizontally over the heating furnace, and are each supplied with the materials by a vertical pipe leading from a hopper and opening into one end of the retort. This pipe may be fitted with an Archimedian screw for regulating the feed. The materials are slowly traversed through the retorts by another screw extending along the interior of the retort, and rotated slowly by worms and worm wheels, &c. This latter screw is fitted with projections for stirring the contents of the retort. At the discharge end of each retort is a chamber having a pipe communicating with another main pipe which carries off the vapours. The bottom side of the chamber has a receiver for the charcoal, which is fitted with slides to divide it into separate compartments. The upper portion of the receiver is surrounded by flue space, whilst the lower portion is beyond the brickwork, to allow the charcoal therein to cool before it is discharged.

WOOD, W. and R. *Improvements in machinery or apparatus for spinning, doubling, and sizeing yarns or threads.* Dated Mar. 24, 1858. (No. 622.)

The object here is to size yarns or threads during the spinning or doubling. For spinning threads from roving the patentees employ the throstle frame having an under clearer acting upon the front fluted roller, and for doubling or giving extra twist to single thread they employ the doubling frame; and for each purpose they modify the ordinary flyers so that the friction of the threads upon them will be greatly diminished. This modification of the flyers consists in making them similar to the tube flyer used in slubbing and roving frames. The size is applied to the thread, between the rollers and the guide wires, by a roller rotating in a trough. The size is composed of a solution of gum tragacanth and water.

HIELAKKER, J. V. *An improved machine for compressing coal, other fuel, and substances requiring pressure.* Dated Mar. 24, 1858. (No. 623.)

This invention cannot be described without engravings.

THIRION, A. L. *An improved method of transforming circular movements.* Dated Mar. 24, 1858. (No. 624.)

This consists in connecting the shafts of wheels to which motion is to be communicated. 1. By a number of circles or rings cut through and connected together end to end, so that the whole will form an elastic spiral for communicating motion from one shaft to another, not in a line with the same. 2. By a number of circles or rings (the first of which is attached to the driving shaft) turning upon a curved or semi-circular axis, the circles being connected to each other by bands, so that when motion is imparted to the first circle it actuates the second circle, and so on, through the whole number of circles employed, when the motion is transferred to the desired wheel or shaft.

CLARK, W. S. *Improvements in the construction of railways.* (A communication.) Dated Mar. 25, 1858. (No. 625.)

The patentee claims the construction of a continuous foundation rail of successive sections of upright iron arches or beams, the upper surface of which shall form a plane, and held in position by upright iron ties with tenon and wedge or keys on the outside, and surmounted and further bound together by a wrought-iron coping rail in which is formed a deep groove to fit on to the comb of the foundation rail, into which groove is inserted a strip of vulcanized gutta percha, felt, or wood, which forms the bearing on which the coping rail rests. Also a compound joint in the coping rail, and fastening the same by bolts passing through both rails by transversely elongated slots. And also an iron shoe in which the arches rest.

HOPKINS, D. A. *Improvements in journal boxes.* Dated Mar. 25, 1858. (No. 626.)

This invention cannot be described without engravings.

CROOK, W. *Improvements in looms.* Dated Mar. 25, 1858. (No. 627.)

This relates to the shuttle-box motion, and consists in placing in suitable guides two racks working with a pinion geared into them, so as to maintain a perfect balance. The shuttle-box frame is connected to either of the racks, which are made of a length suitable to the number of shuttles employed. To raise and depress the shuttles the patentee passes through the racks spring stops or pins, one above the other, which are acted upon by a pattern strap, so that at the front of either rack a pin or stop projects whenever a change of shuttle is required, the said pin and the rack and shuttles being moved upwards by a lifter, so that as one set of pins are shifted and made to move up, their corresponding racks move simultaneously with them, and the opposite pins and racks are depressed.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

SUTTON, T. S. *Improvements in miners' lamps.* Dated Mar. 18, 1858. (No. 558.)

Here a miner's lamp is combined with a candle lamp, so that a candle made suitable for burning its wick is constantly raised to a socket above which is the ordinary chamber, enclosed at the sides by wire gauze, and at the top by a cap of wire gauze.

TOWNEND, R. and W. *Improvements in pistonvalve musical instruments.* Dated Mar. 18, 1858. (No. 559.)

This consists in so forming and arranging the valves and the wind passages that the inventors obtain a direct passage for the wind, whereby they maintain the same uniform quality of tone whether the valves be open to one passage or to another.

REDIER, J. A. J. *An improved chronometer, called "chronoscope."* Dated Mar. 18, 1858. (No. 562.)

This instrument, termed a chronoscope, is intended for delicate chronometrical observations in astronomy; it can also be used for experiments of short duration, and is based on the faculty possessed by the ear of detecting the coincidence of two shocks. It is susceptible of several modifications in its form.

MENNONS, M. A. F. *Certain improvements in the production of motive power.* (A communication.) Dated Mar. 19, 1858. (No. 566.)

The improved machinery is composed, 1. Of a pendulum lever, which, after receiving motion by a cord, comes in contact with springs which cause it to rebound and continue oscillating. This motion is assisted by the gravity of water placed in tubes at the bottom of the pendulum. 2. Of the combined action of a number of balance levers and pendulums. 3. Of a tubular wheel or drum, containing water, and put in motion by gearing in connection with the levers and pendulums.

MUNTZ, G. F. *Improvements in mixing zinc with copper and other metals.* Dated Mar. 19, 1858. (No. 572.)

Here the copper, etc., are removed from the melting furnaces, and placed in a closed vessel, and whilst it is at a high melting temperature the zinc is introduced.

MENNONS, M. A. F. *Certain improvements in the piercing of tunnels.* (A communication.) Dated Mar. 19, 1858. (No. 575.)

This consist in forming a man-hole at the axis of the tunnel, which hole, when it has attained a certain length, is mixed with gunpowder, in order to blow up the earth to form the first arch. A number of arches are formed in this manner gradually varying in size. It is then built up with masonry.

HAIGH, W. *Improvements in the manufacture of a certain description of paper, and in the machinery connected therewith.* Dated Mar. 20, 1858. (No. 576.)

This consists in coating the surface of common paper either with sulphate of barytes, white lead, china-clay, or other similar and well-known substance, as a body which may be tinted or coloured to any shade desired, and applied to such surfaces by means of brushes or rollers. It is chiefly applicable to "brown paper."

PARSONS, P. M., and W. DEMPSEY. *Improvements in the construction of switches and crossings for railways.* Dated Mar. 20, 1858. (No. 578.)

In the construction of switches from the flat bottom rail, the inventors connect the keel of the tongue to the ordinary rails of the line by fishing plates, and taper the point off, and house it under the main rail. In the construction of crossings from similar rails they apply rails, bars, or plates, between the wing rails and the wing and point rails, for the flanges of the wheels to run upon. In crossings to other form of rails, as well as the above, they construct the point and wing rails of rolled or forged steel, or steel iron, and of such form that the flanges of the wheels can run upon them. And they construct crossings by cutting bars of suitable sections in two, diagonally reversing the two parts, and uniting them firmly together by bolts, rivets, or otherwise.

BROWNE, P. *Improvements in the screw-propeller, partly applicable to the raising of fluids.* Dated Mar. 20, 1858. (No. 582.)

Here four blades are used, two of which may be brought in a line with the other two. Under one modification two of the blades are convex, and the other two are concave, and of a coarser pitch, and are attached to the back of the convex blades by a suitable coupling. These blades may be worked at any angle to each other. By placing these blades in a horizontal position they will be adapted for the raising of fluids.

ALLEN, W. *Improvements in machinery for manufacturing screws.* Dated Mar. 20, 1858. (No. 584.)

The object here is to avoid the necessity of a person constantly attending the machine. The head-stocks, spindles, and pulleys are as heretofore, but in each machine a pinion gives motion to a cog-wheel in an axis on which there is a bevelled toothed wheel, which drives another bevelled toothed wheel on an axis at right angles to the previously mentioned axis, and such last axis, by a worm or screw, gives motion to a screw-wheel on an axis, on one end of which is affixed a face-plate with moveable studs, the face-plate being formed with holes to receive the studs, which are placed at distances apart on the face-plate, according to the lengths of screws to be cut. The studs act on a lever which acts in the dies, and such lever is pressed or acted on by another lever and by a weight or spring.

PITMAN, J. T. *Improvements in the mode of preparing and moulding clay into bricks, tiles, pipes, and other similar manufactures.* (A communication.) Dated Mar. 20, 1858. (No. 589.)

These consist in first passing the crude clay between two metallic rollers in the bottom of a hopper, so geared as to revolve at unequal velocities and brought near together. It is then passed through the pug mill, the upright shaft having radial blades to force the mass down through the open bottom into a channel, whose inner side is the surface of a large cylinder revolving on a vertical axis, while the outer one is formed of a series of small but similar rollers geared to the shaft of the large cylinder. A series of spring guard plates subtend the angular spaces between, and are in contact with, the small rollers, and allow the periphery of each roller to project somewhat beyond them into the channel. The clay is then forced into a forming die, where, in passing, the mass is cut into the length of bricks, &c., by a revolving knife, consisting of two thin blades upon a revolving arm, so adjusted as to pass through narrow slits left in the forming die, and cut the clay while the mass is motion. Thus cut, it is forced onwards by the pressure of the incoming mass out on to an endless belt and taken away.

BROOMAN, R. A. *Improvements in apparatuses for exhibiting daguerreotype, photographic, and other stereoscopic views and pictures.* (A communication.) Dated Mar. 22, 1858. (No. 590.)

These consist in arranging inside a case an endless belt having a series of slides to receive views attached to it so as to stand perpendicular to its face. By moving the belt through a handle outside the case, the pictures are presented successively to magnifying glasses, or to suitable openings. By arranging the pictures at right angles to the face of the endless belt, a larger number may be exhibited in a case of a given size than by the arrangement of the same parallel with the face of the belt. The inventor secures the pictures in the slides by elastic bands and notches formed in the ends of the grooved portions of the slides.

BAILEY, C. C. *An improved method of supplying the feed water to boilers, and in the apparatus connected therewith.* Dated Mar. 22, 1858. (No. 593.)

In this feeding apparatus some portion between the cistern and boiler is in direct contact with the fire beneath the boiler. This part of the apparatus is composed of a metal of such hardness as not to melt whilst the proper supply of water is passing through it; but upon the stoppage of such supply the metal will melt, and destroy the communication between the supply cistern and boiler, and prevent a further supply of water coming into the over-heated boiler.

JUCKES, J. *Improvements in apparatus for supplying coals to stoves and fire-places.* Dated Mar. 22, 1858. (No. 595.)

Here the bottom of the fire-place slides out horizontally and moves on necks or axes at the front, so that it may assume an inclined position when away from the fire. The bottom is mounted on a sliding frame, the back of which when the frame is slided forward comes under the ignited fuel, whilst the bottom of the fire-place is moved out horizontally. When the frame is out the bottom of the fire-place assumes an inclined position, and coal is placed above the inclined bottom. The frame is then slided back, and the bottom of the fire-place raised into a horizontal position, by which the fresh coal is raised up under the ignited fuel. To facilitate the using of the fresh coal there is a curved plate fixed below the sliding frame, the curvature of which corresponds with the radius of the moveable bottom of the stove.

WRIGHT, J. *An improved method of, and apparatus for, punching rolled metal plates and angle iron.* (A communication.) Dated Mar. 22, 1858. (No. 598.)

This consists in punching holes in the metal when it is hot and soft during the rolling. One of the rollers has a groove around a circular raised portion which acts as the punch.

JOWETT, H. A. *Improvements in machinery for transmitting telegraphic communications and making signals, applicable to railways and other purposes.* Dated Mar. 22, 1858. (No. 599.)

Here tubes of water are used, to which are attached instruments for indicating the displacement of water at either end by pistons working in cylinders.

ATHERTON, C. *Improvements in furnaces, fire-grates, and stoves.* Dated Mar. 23, 1858. (No. 601.)

This consists in placing feeding chambers, extending to the whole length of the fire-grate, as receptacles for the fuel above the level of the grate bars, from which chambers the fuel descends to the furnace spontaneously through openings extending the whole length of the furnace. The grate bars are arranged in a peculiar way.

STOCKER, A. S. *Improvements in the manufacture*

of railway axles and tubes. Dated Mar. 23, 1858. (No. 602.)

This consists in making axles and journals out of coiled tubes, or one or more tubes of metal one within the other, the main tube forming the body of the axle being shrunk on to two shorter tubes which form the journals, and which may be further secured by passing bolts through them. The improvements in tubes are similar to the foregoing.

MOULD, W. *Improvements in machinery or apparatus for preparing and spinning fibrous materials.* Dated Mar. 23, 1858. (No. 603.)

Here the inventor passes the slivers at once to bobbins placed in horizontal positions, and having two motions, one turning bodily parallel with their axes for giving twist to the sliver, and the other turning at right angles with their axes for winding on. The bobbins rest on drums which revolve at an uniform speed.

PETERS, E. *Improvements in burning bricks and other articles made of brick earth and clay.* (A communication.) Dated Mar. 23, 1858. (No. 608.)

Here the bricks, &c., are placed on trucks, which run on rails, and are caused to pass slowly through a kiln, the chimney of which is placed near the entrance.

KEITH, W. S. *An improved rotary cutting machine.* Dated Mar. 23, 1858. (No. 609.)

This consists of a solid frame of iron, open for some space along its centre, for the reception of certain cutters and spindles. Passing longitudinally through the open part of the frame, are two spindles. On the one end of each of these are fixed two metallic disc cutters, and on the other end is mounted suitable gearing, by which motion is communicated to them, and hence to the cutters, which rotate in planes parallel to each other's face, and generally so that the outer edge of each periphery nearly touches the other. One or both of these cutters has a screw, for regulating the distance of the cutting edges from each other. The other ends of the spindles rest upon a bed which projects out from the central axis of the former, so that one, either, or both of the spindles may be in the central line of the plane, or be oblique to it, a screw or rack motion altering their or its position. At any suitable angle with the plane passing between the cutters is a table on which the material to be cut is laid, and a guide is fixed upon it, and against this guide the material is pressed.

RAMSBELL, W. *Improvements in furnaces and fire-places.* Dated Mar. 23, 1858. (No. 611.)

This relates to the ues of an air pump for supplying air under pressure in connection with supply pipes within the furnace, &c., having a terminal distributing pipe, placed within the furnace for projecting a jet of air, which has been heated to a suitably high temperature during its passage.

JACKSON, R. *Improvements in machinery or apparatus for spinning cotton and other fibrous substances.* Dated Mar. 24, 1858. (No. 613.)

This relates to the self-acting mule and consists in substituting a pair of cone pulleys for the even-surfaced driving pulleys, one upon the mangle or other equivalent shaft, and the other upon the run shaft, and in so arranging the apparatus that the same rod which puts down the fallers may move the driving shaft from the larger diameter to the smaller of the cone pulley upon the mangle shaft, and cause the spindle carriage to run in a "put up" at an increased speed.

PROVISIONAL PROTECTIONS.

Dated September 27, 1858.

2160. X. Boutteville, of Paris, merchant. An improved neckcloth or tie, means of connecting ties to collars and bands, and an improved collar. A communication.

Dated October 14, 1858.

2288. C. Cowper, of Southampton-buildings, Chancery-lane. Improvements in the manufacture of articles of hard vulcanized india rubber and gutta percha, and similar gums. A communication from G. Cuppers.

Dated October 19, 1858.

2330. W. F. Batho and E. M. Bauer, of Salford, engineers. Improvements in screws, worms, and wheels, and in machinery or apparatus for cutting the same.

2332. A. Allan, engineer, T. Whimster, gas engineer, and R. Gray, gas inspector, all of Perth. Improvements in steam boilers, also applicable in part to gas meters, lamps, and lubricating and other apparatus requiring a constant liquid level, and in part to pressure-indicating apparatus.

2334. W. E. Newton, of Chancery-lane. Improvements in apparatus for washing clothes and other articles. A communication.

2338. J. Grant, of Hyde-park-st., capt. late Royal Artillery. Improvements in constructing and arranging ovens suitable for baking bread.

Dated October 20, 1858.

2340. L. Stiebel, of London, merchant, and C. F. O. Glassford, of Greenwich, chemist. Improvements in machinery for moulding washing blues and other materials while in a plastic state.

2341. R. D. Clegg, of Manchester, gentleman. Improvements in screws.

2343. R. Griffiths, of Mornington-road, Regent's-park, engineer. Improvements in baths.

2344. T. Twells, of Nottingham, mechanist. Improvements in machinery for embroidering or ornamenting woven, looped, or laced fabrics.

2345. J. Wainwright, of Birkenhead, dental surgeon. Improvements in ventilating houses and other places.

2346. S. T. Clarke, of Kildare-terrace, Westbourne-park, gentleman. Improvements in apparatus for crossing bankers' cheques and drafts.

Dated October 21, 1858.

2347. C. C. Alger, of Parliament-st., Westminster, gentleman. Improvements in cupola furnaces.

2348. J. and S. Marland, of Walsden, Lancaster, machinists. Certain improvements in power looms.

2349. P. Clerc and A Piaget, of Clerkenwell. An improved method of winding watches, chronometers, and time-pieces, without the use of a separate key.

2351. J. M. Napier, of York-road, Lambeth, engineer. Improvements in printing presses and printing machines.

2353. G. Redford, of Moseley, Worcester. A circular and self-acting cartridge pouch.

2354. J. Baldwin, jun., of Birmingham, paper maker. Improvements in files or holders for papers, letters, bags, and other similar articles.

2355. R. A. Brooman, of 166, Fleet-st., London, editor of the *Mechanics' Magazine* and patent agent. Improvements in knitting frames. A communication from Madame Hammerlin.

2356. R. A. Brooman, of 166, Fleet-st., London, editor of the *Mechanics' Magazine* and patent agent. Improvements in apparatuses for regulating the supply of fluids. A communication from P. J. Guyet, of Paris.

2357. R. A. Brooman, of 166, Fleet-st., London, editor of the *Mechanics' Magazine* and patent agent. Improvements in cocks, taps, and other apparatuses for regulating the flow of fluids. A communication from P. J. Guyet, of Paris.

2358. J. H. Johnson, of Lincoln's-inn-fields. Improvements in apparatus for lubricating railway axles and other bearings. A communication.

Dated October 22, 1858.

2359. J. Burridge, house painter, of Great Portland-st. Improvements in fire-lighters.

2361. J. and W. Bagnall, of Westbromwich,

ironmasters. An improvement in the manufacture of iron.

2362. A. Shaw, of Grantham, leather dresser. A new method or mode of raising nap on the linings of sheep skins.

2363. R. Waller, of Baker-st., Portman-sq. Improvements in obtaining motive power, and in apparatus connected therewith.

2364. R. Kennedy and J. Armstrong, of Lisburn, Ireland. An improved kiln for drying grain.

2365. C. Clay, of Wakefield. Improvements in apparatus for harrowing, scarifying, and cultivating land.

Dated October 23, 1858.

2366. E. Palmer, of Thetford, engineer, and E. Palmer, of Thetford, ironfounder. Improvements in machinery or apparatus for cutting hay, straw, or other similar substances.

2367. P. C. Stortz, of Liverpool, photographer. An improvement for taking life-size pictures from smaller pictures, either with or without the aid of photography.

2368. E. C. Shepard, of Jermyn-st., gentleman. Improvements in electric lamps. A communication.

2369. R. Bodmer, of Thavies-inn. An improved toy or plaything for children. A communication from C. Thévenot.

2370. G. Davies, of Serle-st., Lincoln's-inn. Improvements in weaving. A communication.

2371. J. C. Martin, of Charlewood-road, Putney, gentleman. An improvement in the manufacture of metal moulds for moulding plastic substances.

2372. W. E. Newton, of Chancery-lane. Improvements in pumps. A communication.

2373. W. E. Newton, of Chancery-lane. Improvements in telegraphic apparatus. A communication.

Dated October 25, 1858.

2374. E. Cottam, of Lower Belgrave-pl., Pimlico, engineer. Improvements in the internal fittings of carriages.

2375. M. Mason, of Manchester, machinist. Improvements in elevating stands or stages for the use of hosemen in extinguishing fires, also for decorating windows, public buildings, and other purposes.

2376. J. J. Welch and J. S. Margetson, of Cheapside. Improvements in the manufacture of scarfs for gentlemen's wear.

2377. F. Fowke, of South Kensington, captain R.E. Improvements in umbrellas and parasols.

2378. J. Robb, of Aberdeen, merchant. Improvements in propellers for ships and boats.

2379. T. and J. Ashworth, of Pendleton, manufacturers. Certain improvements in power-looms for weaving.

2380. W. Craddock and J. White, of Archer-st., St. James's, harness platers. Improvements in the connecting links of harness hames.

2381. G. Kent, of High Holborn, machinist. An improved churn. A communication.

2382. A. V. Newton, of Chancery-lane. An improvement in the manufacture of candles. A communication.

2383. S. R. Parkhurst, of New York. Improvement in cotton gins.

Dated October 26, 1858.

2384. M. Mason, of Manchester, machinist. Improvements in self-acting feeding machines, or apparatus for all descriptions of steam or other letterpress printing machines or presses.

2386. C. Wieland, of Commercial-road, Limehouse. Certain improvements in chronometers, watches, and such like time-keepers.

NOTICES OF INTENTION TO PROCEED.

(From the "London Gazette," November 9th, 1858.)

1445. T. V. Flinn. Drainage.
1466. H. N. Nissen. Preparing paper.
1467. W. Baker. Sewers.
1470. W. S. Wheatcroft and J. N. Smith. Locks, &c.
1472. B. Nicoll. Circular saws.
1474. J. Petrie, jun. Drying warps.
1476. T. Whiteley. Millboard.
1479. T. Blinkhorn. Steam boilers and engines.
1480. T. Riddell. Omnibuses; breaks.
1482. W. T. Smith. Winnowing, &c.
1487. P. R. Hodge and G. Spencer. Preventing recoil of springs.
1490. T. Mellodew, J. Duxbury, and E. Layfield. Spinning and doubling.
1501. O. Sarony. Photographic pictures.
1506. E. Simons. Castors.
1508. G. J. Newbery. Coverings for floors.
1512. J. Greenwood. Propellers.
1522. P. Mercier. Peat.
1524. W. Clissold. Cutting dyewoods.
1529. A. W. Sleigh. Floating sea-barriers.
1531. J. Marland and J. Widdall. Self-acting hook.
1532. H. Gidlow. Breaks for steam engines.
1542. M. Scott. Breakwaters.
1618. W. A. Lloyd and E. Edwards. Aquaria tanks.
1626. W. Tasker, jun. Thrashing machines.
1652. B. Blake. Kiln.
1731. W. Hartley. Steam engines.
1774. J. B. Pascoe and J. R. Thomas. Feeding oilers.
1809. T. Ingram. Railway breaks.
1857. J. Holt. Looms.
1866. P. E. Chappuis. Stereoscopes.
1915. T. Averill. Mills. A communication.
1919. A. Rottmann. Fastenings. A communication.
2115. E. Riepe. Casting steel.
2116. G. M. Levi. Iron. A communication.
2160. X. Boutteville. Ties and collars. A communication.
2185. W. Blake. Fire escape.
2208. C. E. Oldershaw. Telegraph cables.
2238. J. Mitchell, H. Mitchell, and T. England. Spinning.
2261. J. L. and F. L. Hancock. Implements for tilling, sowing seeds, &c.
2300. R. R. Jackson. Sizeing yarn.
2313. J. Hick, W. Hargreaves, and R. Harwood. Governors.
2315. A. Robertson. Applying starch.
2322. R. Tidman. Paying out cables.
2332. A. Allan, T. Whimster, and R. Gray. Steam boilers, &c.
2334. W. E. Newton. Washing clothes. A communication.
2354. J. Baldwin, jun. Holders for papers.
2358. J. H. Johnson. Lubricating. A communication.
2359. J. Burridge. Fire-lighters.

The full Titles of the Patents in the above List can be ascertained by referring back to their numbers in the Lists of Provisional Protections previously published.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

2450. J. Patterson.
2466. W. Gardner.
2486. A. C. L. Devaux.
2487. R. A. Brooman.
2492. R. Threlfall and J. Higson.
2503. W. Davis.
2504. L. B. Advielle.
2509. W. Lund and A. Bain.
2512. H. J. Betjemann.
2532. A. V. Newton.
2552. J. Homan.
2561. J. Burrows.
2597. G. Collier and J. W. Crossley.

LIST OF SEALED PATENTS.

Sealed November 5th, 1858.

1005. J. S. Willway.
1007. W. Heap.
1008. E. J. Scott.
1009. H. Ashworth.
1015. J. Wright.
1024. J. J. Field.
1033. J. T. Robson.
1041. W. H. Ogden.
1145. F. G. Underhay and J. L. Clark.
1193. C. Cowper.
1195. V. L. Vodoz.
1293. D. Irons.
1313. T. W. Mellor and W. Jamieson.
1481. H. W. Wimshurst.
1987. W. Warne.
2007. W. P. Piggott and S. Beardmore.
2013. S. Hogg, W. P. Piggott, and S. Beardmore.
2023. W. Tucker.
2087. A. H. J. Bastable.

Sealed November 9th, 1858.

1046. W. G. Taylor.
1047. J. B. Pim and C. Payne.
1052. E. Fairburn.
1053. J. Soutter.
1055. A. Parkes.
1056. A. Parkes.
1063. L. Durand.
1064. M. Diosy.
1066. J. A. Clarke.
1071. R. Knight.
1075. J. S. Bailey and W. H. Bailey.
1079. A. M. Dix.
1090. J. Macintosh.
1199. C. Stanley and J. Fittall.
1463. J. Shaw.
1464. J. Shaw.
2085. G. C. Grimes.
2098. J. R. Scartliff.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions.

NOTICES TO CORRESPONDENTS.

We regret that the letters of *Mr. Archibald Smith, P. M.*, and some other gentlemen, did not reach us until this Number was made up. When the New Series of the MECHANICS' MAGAZINE is commenced, we shall keep our columns open until Thursday in each week, instead of Tuesday, as at present.

Articles and Correspondence designed for insertion in the ensuing Numbers of the *Mechanics' Magazine* must reach the Office by the Tuesday of each week, at the latest. It is highly desirable that they should be forwarded earlier if possible.

CONTENTS OF THIS NUMBER.

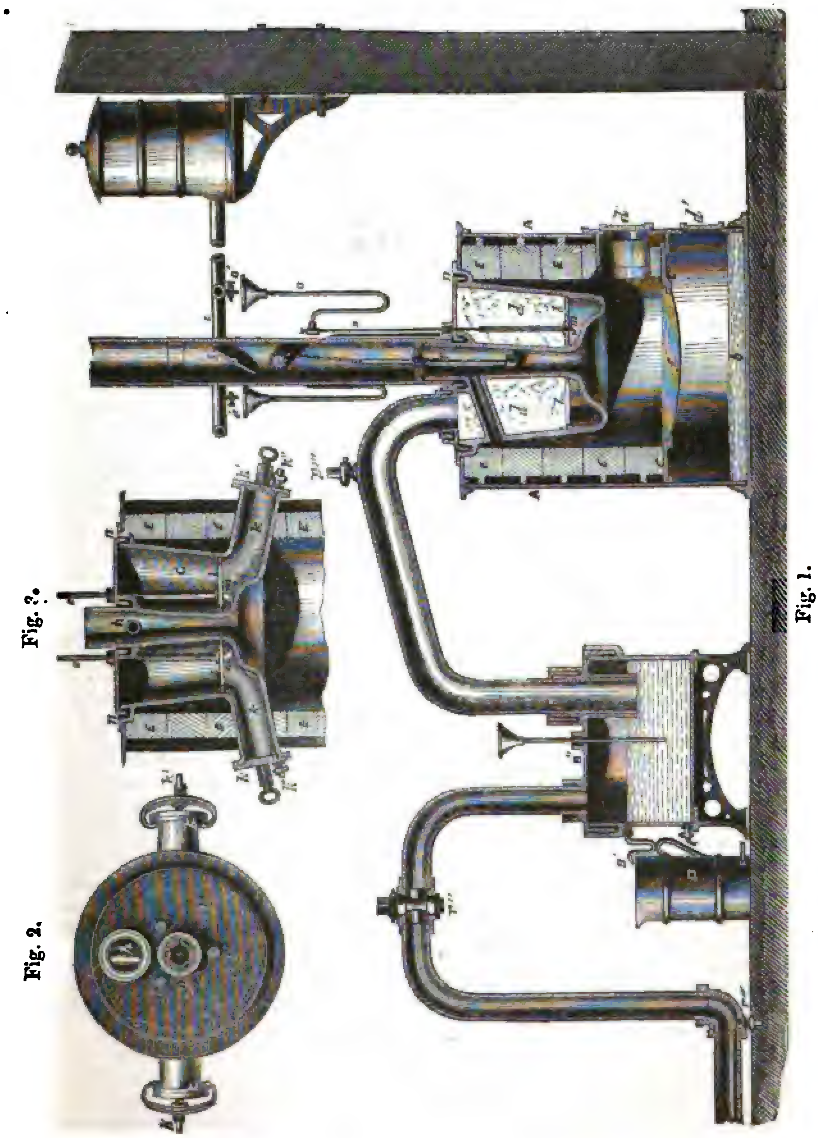
LONDON: Printed and Published by Richard Archibald Brooman, of 166, Fleet-street, in the City of London. Sold by A. and W. Galignani, Rue Vivienne, Paris; Hodges and Smith, Dublin; W. C. Campbell and Co., Hamburgh.

Mechanics' Magazine.

No. 1841.] SATURDAY, NOVEMBER 20, 1858. [PRICE 3D.

Edited by R. A. Brooman and E. J. Reed, 166, Fleet-street, London, E.C.

GERNER'S PATENT APPARATUS FOR PRODUCING GAS FROM OILS, &c.



GERNER'S PATENT APPARATUS FOR PRODUCING GAS FROM OILS, &c.

Mr. H. Gerner, C.E., of Bayswater, has patented an invention which consists in the construction and adaptation of the retort used in producing gas from oils, or from fatty or resinous matters, so as to regulate and economize the heat, increase the production of the gas, and afford facilities for cleansing and repairing. The patentee constructs the retort of a cylindrical or other form, and through the centre, from the base upwards, forms a flue or chimney. At the sides of the retort he arranges pipes (he prefers three), which form flues leading from the outside of the retort, through it, and into the central flue. The top of the retort is made of a separate piece, and fits securely by means of a joint of lead or other fusible metal. The retort is erected upon bricks or fire-clay, so as to have a space between it and the clay or brick-work. The fire is placed at the base of the retort, and by means of a damper he causes the heat to pass either up the central flue, or the sides, and through the pipes, or both ways. The oil or fatty or resinous matter is supplied through feed tubes (say three), arranged with syphons and funnels, and made secure through the top of the retort, with their outlet orifices near the internal base of the retort and near the central flue. In the interior of the retort he arranges a grate above the orifices of the feed tubes, and upon this grate and around the central flue and pipe flues and feed tubes places some material capable of sustaining a red heat. He prefers to use scrap iron, or earthenware, or cokes, or a mixture of these. The gas or vapour of the oil arising from the heated base of the retort, will pass through the grate and the said materials, and be thus rendered more subtile; and from thence the gas is passed in the ordinary manner, through a pipe from the top of the retort into the condenser, and subsequently into the gasometer. He also arranges or casts with the outside of the retorts two pipes or passages, which protrude through the brickwork or outside of the stove, and are fitted with "man-hole" lids or covers, which may be removed at any time it is desired to clean or repair the interior of the retort.

Fig. 1 of the engravings on the preceding page is a section of the apparatus complete. The stove, A, is of thin sheet iron lined with fire-clay rings, E, E, having an air space, *a*, to prevent radiation of heat; C is a cast-iron ring, resting on angle iron for supporting the fire bars, *f*, and fire-clay rings; *b* is a cast-iron tray filled with water, the steam from which facilitates the draught; *d'* is the fire door; *d''* the ash-pit door; G is the improved retort, in which the gas is generated, having a perpendicular flue, *g*, through its centre. In figs. 1 and 2, *h*, *h*, are three smaller flues cast in the retort, passing from the sides into the centre flue. The lid is secured by a lead joint, *n*, *n*; *l*, *l*, is a cast-iron grating for supporting the material used in the retort, and in which are screwed three guides for feed pipes, *m*, *m*, figs. 1 and 3, *d* is the purifying material, charcoal and lime. The feed pipes, *o*, *o*, are screwed into the lid of the retort, and made tight by a lead joint; the two pipes, *k*, are cast on the retort of sufficient length to project from the outside of the stove so that the bottom of the retort may be easily cleaned. The cover *k'* is secured by a clip and screw; *k''*, *k''*, are small cocks to ascertain if gas is being made; *r* is a damper, for regulating the draught through the flues in the retort; *r* is a rod and chain attached to a roller, having a spindle with a handle on the outside of the chimney, so that the damper can be drawn up or let down; *s* is a common damper; C' is a vessel for containing oil; *t* is a wrought-iron pipe, screwed into the boss of the vessel, C', and passes round the chimney, in which are screwed three small cocks, *o'*, *o'*, for regulating the supply of oil to feed pipes, *o*, *o*; E is a cast-iron pipe for conducting the gas to condenser, having a lead joint on the cover of the retort, and an oil joint on the condenser; the cock, p^2, is for ascertaining if gas is being generated; B is the condenser, two-thirds filled with oil; B' is a syphon for the residuum to pass off into the vessel, D. The cover of the condenser rests in an oil joint; B'' is a feed pipe screwed into the cover of the condenser, and made tight by a lead joint; E' is an iron pipe, screwed into the cover of the condenser, and made secure by a lead joint, through which pipe the gas passes to gas holder; *r n* is a cock for shutting off communication with the gas holder; the small cock *r'''* is for letting off any condensation in the pipe, E'.

THE LISBON AND SANTAREM RAILWAY.

THE first meeting of the Session 1858-59 Institution of Civil Engineers, Nov. 9, 1858, was occupied by receiving a "Description of the line and works of the Lisbon and Santarem Railway," by Mr. J. S. Valentine, M. Inst. C.E.

The author commenced by alluding to the great deficiency, or almost total absence, of all facilities for internal communication in Portugal; stating that prior to 1853 no roads existed over which wheeled carriages with springs could travel, with the exception of that between Lisbon and Cintra, a distance of 18 miles, and from Lisbon towards the north, for about 25 miles, both of which were made within a very recent period. Since that year some improvements had been effected, particularly on the highway between Lisbon and Coimbra, on the road to Oporto, a distance of about 100 miles. Four-horse mail coaches, built after an English model, had been introduced on this line, from Carregado, the present terminal station, northward, of the railway described in the paper, and Coimbra. Notwithstanding these partial improvements, there were still many thousand acres of land lying unproductive, owing to the want of roads, and the consequent cost of conveying the produce to market, which could only be effected, in many cases, by transporting it, at great cost, on the backs of mules.

The author then proceeded to remark, that railways in Portugal were entirely under the control and protection of the Government; the method of granting concessions, as well as the general supervision exercised over the works during construction, being similar to the French system. The ruinous competition, and the costly Parliamentary contests, the result of the English system, were, therefore, avoided: but, on the other hand, the constant interference of the Government officers with the practical execution of the works, as well as that which might be apprehended in the working of the traffic, was attended with many and grave disadvantages, of which the author narrated several striking instances. The mode of granting a concession for a railway was then described,—the Government exercising its control over all public works, by means of a Council of State, called "The Ministry of Public Works and Mines." When the project originated with the Government, a programme, or specification, was issued by the Minister of the Interior, inviting proposals, up to a given period, from those who might be willing to tender for the concession. The principal points in this programme were then detailed, upon which a "Provisional Concession" was granted, the "Definitive Concession" being delayed, until detailed drawings and specifications had been prepared and approved. The concession was then submitted to the Cortes, and subsequently had to receive the Royal assent. There was a slight difference in the mode of proceeding when the project originated with a private individual or a company. In this case the proposal which was made was published, and the concession was put up to public auction. If more advantageous terms were offered than by the original projector, and if the latter declined to take it upon these improved terms, then the concession was granted to the party offering them. Before the operations were commenced, the Government appointed one or more fiscal engineers to superintend the works, and, in addition, it was necessary to obtain official sanction for every design, and until a decree, called a "Portaria," appeared in the Government *Gazette*, no work could be proceeded with, except at the risk of its being afterwards condemned. This system was most objectionable, inasmuch as it fettered the freedom of action of the engineer, on whom the responsibility in reality rested.

It appeared that, up to the present time, four concessions had been granted, for a period of ninety-nine years, for railways in Portugal, the terms of which varied considerably, but all had either received a guarantee of interest upon the capital, or a subsidy, or other privileges. The first concession was for the railway described in this paper, which had a minimum interest, guaranteed by the State, of six per cent. per annum for fifty years, with an additional half per cent. to form a sinking fund, and, on the completion of the line, a bonus of two per cent. on the capital was to have been paid to the concessionaires. This concession had subsequently been cancelled, and the line was now included in that for the railway from Lisbon to Oporto. The second concession was for a railway south of the Tagus, from Barciro to Vendas Novas and St. Ubes. It was given to a Portuguese company, with a subsidy of about £1,700 per kilometre, a free grant of all the timber required in the works, and of the Government lands over which it might pass. The third concession was for a line from Lisbon to Cintra, with the privilege of constructing docks at Lisbon. This was granted to a French company, without either a guarantee of interest or a subsidy; but a large quantity of land at Lisbon, which the company proposed to reclaim from the Tagus, was ceded to it. The fourth concession, for a railway from Lisbon to Oporto,

had been granted to Sir S. Morton Peto, Bart., with a subsidy of £5,500 per kilometre, timber from the Government forests on the line, a free grant of all Government lands over which it might pass, and of all mines and minerals within half a kilometre on each side of the line which had not been already conceded to other parties.

The land required for railway purposes might be purchased either by private agreement or by legal expropriation; but the latter process was generally found to be necessary, on account of the difficulty of ascertaining that all rights and interests in the property were extinguished. The paper then proceeded to describe minutely the expropriation system, which was not an expensive process, nor did it occupy much time. When the parties could not agree as to terms, arbitrators were appointed, but, should dissatisfaction still be felt, an appeal could be made to the superior courts in Lisbon. This system, although good in principle, and simple and expeditious in practice, was liable to great abuses; consequently the cost of the land for the Santarem Railway proved much greater than was expected, in some cases exorbitant prices having been demanded and obtained.

The author then narrated the successive stages which resulted in the "Central Peninsular Railway of Portugal," to the first section of which, from Lisbon to Santarem, a distance of forty-five miles, he was appointed engineer; not, however, until the contract had been determined between the Government and the Company. Upon examining the country, he found it necessary to make some material alterations in the line proposed, particularly at each end. For six miles out of Lisbon, as far as Sacarem, it was designed to be carried through a hilly country, with steep gradients and sharp curves. The site selected for the principal terminus at Lisbon was at the north side of the town, far from the river Tagus and the commercial part of the capital, which would have rendered necessary a branch line, nearly two miles in length, to the river, for the accommodation of the merchandise traffic connected with the port. Instead, the author substituted a line with better gradients and curves, and lighter works, having a terminus adjoining the Tagus, within a short distance of the Custom-house. The Santarem end of the line was also entirely changed, for the purpose of removing it as much as possible out of the influence of the great floods to which the Valley of the Tagus is subject, and also to facilitate the carrying forward the next section to the north.

The works were inaugurated on the 17th of May, 1853, and shortly afterwards a company was formed, the capital of which was £800,000,—the contract for the entire execution of the works, and for furnishing the rolling stock, being taken by Messrs. Waring Brothers and Shaw.

This line was constructed along the northern side of the Valley of the Tagus, skirting, and in places passing through, the high grounds which bounded it, and which, in several localities, especially at Lisbon and Santarem, terminated in high cliffs on the river itself. The exact course of the line was then pointed out, and the nature and extent of the works described. After leaving Lisbon, it entered the high ground at Xabregas, successively arriving at the villages of Poço do Bispo, Olivaes, and Sacavem, at each of which there was a third class station. From this place to the town of Villa Franca, a distance of twelve-and-a-half miles, the works were similar to those in the marshland districts of Lincolnshire and Cambridgeshire. Upon this portion of the line there were two third-class stations, to accommodate the villages of Povoa and Alverca, and a second-class station at Albandra, where the Railway crossed the famous lines of Torres Vedras, which here terminated on the Tagus. After leaving Villa Franca, where there was a first-class station, the line was carried upon a low embankment to the river Carregado, where there was another first-class station for the accommodation of the traffic upon the new mail road, from this place to Coimbra. Thence it proceeded to the villages of Azambuja, Virtudes, and Ponte Sa. Anna, where there were second-class stations. It then skirted the foot of the hills to Ponte d'Asseca, where it crossed the river and valley, entering the high ground, or promontory, on which stood the town of Santarem, the line terminating at a public road about one mile from that town. The total length of the line was nearly forty-five miles. The gradients were for the most part good, upwards of thirty miles being practically level, and the steepest inclination being 1 in 111. The curves were also equally favourable, and the works were generally of an easy character. The earthworks averaged 45,535 cubic yards per mile, the cuttings being principally in a dry loam, intersected by thin beds of hard rock, composed of marine shells. The embankment along the margin of the Tagus at Lisbon, which consisted of soft, black mud, was formed of clay and rock from the cuttings, the latter affording an admirable protectiou to the outer slope, which, by the action of the waves between high and low water, gradually assumed a form resembliing a natural beach. The Fiscal Engineer

insisted that a heavy wall of masonry should be constructed, but this demand was successfully resisted, and the result had justified the expectations of the Author. The embankment across the valley of the river Sacavem also caused some anxiety, owing to the weakness of the alluvial soil occupying the ravine, which originally formed the bed of the river; but after many thousand yards of dry sandy loam and rock had been deposited, and had been buried in the earth, it became thoroughly consolidated. The bridges were neither numerous nor large; the only ones considered worthy of notice in the paper being those over the public road from Lisbon to Poço de Bispo, at Xabregas, and over the river Sacavem. The former consisted of one skew opening, (at an angle of 32° 30′,) 22 feet 4 inches in width on the square, and of three arches, each 22 feet 6 inches span, and one 9 feet span in the east abutment. The principal part of the work was executed in dressed ashlar masonry, with rubble backing, the arches being turned in brick, and the superstructure of the main opening being formed of cast iron. The Sacavem bridge consisted of two side arches, each 25 feet span, and of a centre opening 100 feet span, crossed by two wrought-iron box girders, each 108 feet in length, 8 feet in depth, and 2 feet in width across the top and bottom plates; thirty-five transverse girders each 25 feet 6 inches in length, 15 inches in depth, and 6⅞ inches across the top and bottom flanges, rested upon the bottom flanges of the large girders. The centre breaking weight of one main girder was 303 tons, and of the bridge, equally distributed, 1212 tons. The total weight of the iron work was 80 tons.

The permanent way was composed of a single-headed rail, weighing 60 lbs. to the yard, transverse timber sleepers, and ordinary cast-iron chairs, which were attached to the sleepers by compressed oak trenails. The ballast consisted for the most part of a coarse red grit, which set well, and being porous, formed a good road.

In conclusion, it was remarked that the partial opening of the line, for passenger traffic alone, to the Carregado station, about 23 miles from Lisbon, had completely disproved the assertion, that the peasantry in that country set no value on time; as it was found that they preferred that mode of travelling to the old and slow methods to which they had been accustomed—even though it was more expensive. The earnings had exceeded £15 per week per mile, there being three trains each way daily.

It was announced that the following paper would be read at the Meeting of Tuesday, the 16th instant: "Statistics of the Railway System in Ireland, the Government Aid afforded, and the Nature and Results of County Guarantees," by Mr. George W. Hemans, M. Inst. C.E.

ON THE HARDNESS OF METALS AND ALLOYS.

Abridged from a Paper by F. Crace Calvert, M.R.A. *of Turin*, F.C.S., *&c.*; *and* Richard Johnson, F.C.S., *&c.* *Read April 6th*, 1858, *at the Literary and Philosophical Society of Manchester.*

The process at present adopted for determining the comparative degree of hardness of bodies consists in rubbing one body against another, and that which indents or scratches the other is admitted to be the harder of the two bodies experimented upon. Thus, for example,

Diamond,	Iron,
Topaz,	Copper,
Quartz,	Tin,
Steel,	Lead.

This method is not only very unsatisfactory in its results, but it is also inapplicable for determining with precision the various degrees of hardness of the different metals and their alloys. We therefore thought that it would be useful and interesting if we were to adopt a process which would enable us to represent by numbers the comparative degrees of hardness of various metals and their alloys.

To carry out these views we devised a machine on the principle of a lever, with this important modification, that the piece of metal experimented upon can be relieved from the pressure of the weight employed without removing the weight from the end of the longer arm of the lever. The machine consists of a lever with a counterpoise and a plate on which the weights are gradually placed. The fulcrum bears on a square bar of iron passing through supports. The bar is graduated and has at its end a conical steel point, 7*mm.* or 0·275 of an inch long, 5*mm.* or 0·197 of an inch wide at the base, and 1·25*mm.* or 0·049 of an inch wide at the point which bears on the piece of metal to be experimented on, and this is supported on a solid piece of iron. The support or point of resistance is lowered or raised by a screw; and when, therefore, this screw is turned the whole of the weight on the lever is borne by the support and the screw. When it is necessary, by turning the screw, the weight on the lever is re-established on the bar, and experimented upon.

When we wished to determine the degree of hardness of a substance we place it on the plate, and rested the point upon it, noticing the exact mark on the graduated

bar, and then gradually added weights on the end of the lever until the steel point entered 3·5*mm*. or 0·128 of an inch during half an hour, and then read off the weight. A result was never accepted without at least two experiments were made, which corresponded so far as to present a difference of only a few pounds. The following table gives the relative degree of hardness of some of the more common metals. We specially confined our researches to this class, wishing the results to be practically useful to engineers and others who have to employ metals, and often require to know the comparative hardness of metals and alloys.

Names of Metals.	Weight employed. lbs.	Calculated Cast Iron = 1000.
Staffordshire Cold Blast Cast Iron—Grey, No. 3	4,800	1,000
Steel	4,600 ?	958?
Wrought Iron*	4,550	948
Platinum	1,800	375
Copper—pure	1,445	301
Aluminium	1,300	271
Silver — pure	1,000	208
Zinc do.	880	183
Gold do.	800	167
Cadmium do.	520	108
Bismuth do.	250	52
Tin do.	130	27
Lead do.	75	16

This table exhibits a curious fact, viz., the high degree of hardness of cast iron as compared with that of all other metals, and although we found alloys which possessed an extraordinary degree of hardness, still none were equal to cast iron.

The results of experiments with the first series of alloys (of copper and zinc) show that all the alloys containing an excess of copper are much harder than the metals composing them, and what is not less interesting, that the increased degree of hardness is due to the zinc, the softer metal of the two which compose these alloys. The quantity of this metal must, however, not exceed 50 per cent. of the alloy, or the alloy becomes so brittle that it breaks as the steel point penetrates. We believe that some of these alloys, with an excess of zinc, and which are not found in commerce owing to their white appearance, deserve the attention of engineers. There is in this series an alloy to which we wish to draw special attention, viz., the alloy Cu Zn composed in 100 parts of

Copper	49·32
Zinc	50·61
	100·00

* This wrought iron was made from the above-mentioned cast iron.

Although this alloy contains about 20 per cent. more zinc than any of the brasses of commerce, still it is, when carefully prepared, far richer in colour than the ordinary alloys of commerce. The only reason that we can give why it has not been introduced into the market is, that when the amount of zinc employed exceeds 33 per cent. the brass produced becomes so white that the manufacturers have deemed it advisable not to exceed that proportion. If, however, they had increased the quantity to exactly 50·68 per cent. and mixed the metals well, they would have obtained an alloy as rich in colour as if it had contained 90 per cent of copper, and of a hardness three times as great as that given by calculation.

The alloy Cu Zn possesses another remarkable property, viz., the facility with which it is capable of crystallising in prisms half an inch in length, of extreme flexibility. There is no doubt that this alloy is a definite chemical compound, and not a mixture of metals, as alloys are generally considered to be. Our researches on the conductability of heat by alloys, which we have recently presented to the Royal Society, leave no doubt that many alloys are definite chemical compounds.

The results obtained from a series of bronze alloys lead to several conclusions deserving our notice. First, the marked softness of all the alloys containing an excess of tin; secondly, the extraordinary fact, that an increased quantity of so malleable a metal as copper should so suddenly render the alloy brittle, for the

Alloy $Cu\ Sn_3$
or
Copper . . . 21·21 } is not brittle,
Tin . . . . . 78·79 }
whilst the alloy Cu Sn
or
Copper . . . 34·98 } is brittle.
Tin . . . . . 65·02 }

Therefore the addition of 14 per cent of copper renders a bronze alloy brittle. This curious fact is observed in all the alloys with excess of copper, $Sn\ Cu_2$, $Sn\ Cu_3$, $Sn\ Cu_4$, $Sn\ Cu_5$, until we arrive at one containing a great excess of copper, viz., the alloy $Sn\ Cu_{10}$, consisting of copper 84·68 and 15·32, when the brittleness ceases; but strange to say this alloy, which contains four-fifths of its weight of copper, is, notwithstanding, nearly as hard as iron. This remarkable influence of copper in the bronze alloys is also visible in those composed of

$Sn\ Cu_{15}$,	containing	88·97	of copper
$Sn\ Cu_{20}$,	„	91·49	„
$Sn\ Cu_{25}$,	„	93·17	„

Copper acquires such an increased degree of hardness by being alloyed with tin or zinc that we thought it interesting to ascertain if alloys composed of these two metals would also have a greater degree of hardness than that indicated by theory; we accordingly had a series of alloys prepared in equivalent quantities.

The results obtained show that these metals exert no action on each other, as the numbers indicating the degrees of hardness of their alloys are rather less than those required by theory. Our researches on the conductibility of heat by the three above series of alloys, throw, we believe, some light on the great difference which the alloys of bronze present as compared with those of tin and zinc; for we have stated above that the latter conduct heat as a mixture of metals would do, and not as the former series, which conduct heat as definite chemical compounds.

[The authors conclude their paper by giving the degrees of hardness of two other series of alloys, viz., those composed of lead and antimony, and lead and tin. In the series of lead and tin they find that tin also increases the hardness of lead, but not in the same degree as it does that of copper.]

THE ATLANTIC TELEGRAPH.

Professor Hughes, whose printing telegraph is extensively used in the United States, and which will also in the course of a few weeks be introduced into Australia to work through the first submarine telegraph of that colony between Tasmania and Melbourne, states himself confident of being able even now to signal through the Atlantic cable, and is anxious to conduct all his experiments upon the wire at his own expense. The Atlantic Telegraph Company, on the other hand, say they have no disinclination to permit Mr. Hughes to try his skill; yet, strange to say, though both parties are willing, nothing is done nevertheless. Now, however, that the matter is made public, Mr. Hughes may feel bound to press his offer, and the Atlantic Company, in fairness and in duty to its shareholders, will perhaps see the necessity of at once accepting a liberal proposal, which, whichever way it results, can do them or their cable no manner of injury, but, on the other hand, may possibly be of immense benefit.

In making these announcements, the *Times* publishes the following remarks, which our readers will be able to correct (in one or two places where correction is needed) by reference to what has already appeared in the *Mechanics' Magazine* respecting Mr. Hughes's instruments:—"It will very likely be interesting to many of our readers if we explain at once on what grounds Mr. Hughes rests his hope of making the defunct wire speak again, especially as by so doing we may be able to point out the general nature of the difficulties which have gradually made the signals from the other side of the Atlantic unintelligible. When the first unsuccessful attempt was made to lay the wire, it will be recollected that it parted from under the Niagara's stern at some 350 miles distance from the Irish coast. The piece thus submerged remained, of course, attached to the shore end for a considerable period, and then, for the first time, the phenomenon of magnetic storms, or, as they are now called 'earth currents,' was observed. Of the causes of these earth currents, or the laws by which they are governed, nothing is yet known. They may be briefly described as irregular currents of electricity passing through the outer wire covering of the cable, and which, according to the laws of induced currents, create another current in the conductor of the cable itself, running in a contrary direction to that in which the earth current travels along the outside. The effect of these on the conductor was, of course, to deflect rapidly the needle of the galvanometer to which it was attached, precisely as if signals were being sent quickly. Sometimes these earth currents were so violent as to cause the needle to vibrate with such rapidity that it was impossible to follow its movements with the eye. Singular enough, these storm currents were always at their worst at 10 o'clock at night and 10 in the morning, while they were, on the other hand, always least felt at 11 o'clock in the morning and 11 at night. Beyond these general facts nothing seems to have been known about them. When the cable was laid last August, the instruments were on the principle of Morse's recording telegraph, according to the system of which three or four currents or signals sent across the Atlantic are necessary to form one *letter* of a word. While the cable was in good order, and its insulation tolerably perfect, this plan worked well enough, its greatest and most serious drawback only being that the method was a very slow one, since on the average four signals were required to one letter, and five letters on the average went to one word. However, all went well until the fast increasing defective insulation of the wire became manifest, and the earth currents began to take a most unpleasant part in the telegraphing. As the electric current of the signals lost force nearing the Irish shore, the earth currents overpowered them,

and in the middle of the letter made one or more unintelligible signs, the task of reading became more and more difficult, till, with the increasing derangement of the line, consecutive words gradually ceased, and at last even letters came only at rare intervals. Comparatively speaking, this difficulty was not experienced on this side of the Atlantic till, for the reasons we have stated, it had long overcome the messages to America; and to this reason is it owing that even the first signals sent from here were constantly answered from Newfoundland with 'Repeat' and 'Send slower.' So much for the stoppage of the wire. The reason for Mr. Hughes's confident belief of being able now to work through simply arises from the fact that his instrument—the printing telegraph—is not exposed to anything like the same amount of risk from earth currents. His instrument is, on a small scale, on very much the same principle as to shape and plan as Mr. Hoe's American printing machine. It is worked by means of key-notes, like those of a small piano, each key being marked with the letters of the alphabet. Thus, touching a key at one end of the wire transmits a current to the other, where, instead of the paper, as in Morse's telegraph, receiving a dint or mark that forms part of a letter, the entire letter itself is printed. The advantage of this is obvious. One current suffices to form one letter instantaneously, instead of four or five currents. Less time is thus given for the action of earth currents; or, even in case of their acting and printing in some cases other letters than those sent, it by no means follows that the letters so misplaced would prevent the accurate meaning of the sentence being read. Allow that under the worst circumstances one-fourth of the letters, owing to the action of the earth currents, were wrong, sufficient would be right and sufficiently consecutive to permit the meaning of the whole to be freely read. At all events, Mr. Hughes's machine utilizes the currents to their utmost, since he makes one suffice for clearly printing one letter, instead of requiring three or four. The only doubt is, can two such complicated machines be made to work with mathematical accuracy when 3,000 miles apart? This objection is urged as something almost insuperable, though none deny that it is purely a mechanical one, and one that can be overcome. So far, however, are we from considering it insuperable, that we think a very simple process would remedy it if practically such an obstacle is found to exist, which we by no means deny might be the case. Both the machines at Newfoundland and Valencia would have to be made with the accuracy of chronometers, it being understood that both are to be put back to a given zero when a message was either sent or received. Let the first current then sent for a message either way liberate and set both instruments in motion, precisely in the same way as the letter is now printed, by liberating the armiture and pressing the paper against the little wheel of type. The proper working of the machine is, however, Mr. Hughes's affair. It is only his offer to the Atlantic Company with which we have to deal, and whether it is worth anything or nothing, should be decided by actual test, and the sooner the better. As the matter stands at present, he has made his offer, and it has not been declined; and so the thing rests, like a child's rocking-horse, moving without advancing."

STEAM YACHT FOR EL HAMI PASHA.

One of the most beautifully-proportioned of the many noble steam yachts which have been constructed in this country for various European Princes made her first trial trip down the river on Saturday last. The *Cleopatra* has been built for Hami Pasha, son of the late Viceroy of Egypt. His estates in Egypt, the richest and most extensive in that country, are devoted entirely to the cultivation of corn, cotton, and sugar, and his trade in the Levant has increased to an extent that has necessitated his building some powerful merchant steamers on his own account. Two of these vessels were built here by Mr, Scott Russell, and the speed, power, and capacity of those ships gave such satisfaction to the young Prince that he at once commanded that gentleman to build him a steamer for his own private use, of size and speed sufficient to enable him, from Constantinople, to visit his Egyptian property in any weather. The model first sent out to the East for the approval of this merchant Prince is said to have been a faultless specimen on a small scale of what such a yacht should be. This, however, was altered to suit certain requirements and Turkish notions, and the changes were of a nature that affected that great speed that would otherwise have been attained. The vessel was positively limited to one funnel, and its fire-bar surface thus diminished; the diameter of the paddle wheels was also reduced, and in order to give increased cabin accommodation abaft, the lines of the stern were enlarged. Nevertheless, Mr. Russell undertook to build her as required, and to guarantee a speed of not

less than 16 statute miles per hour—a guarantee which the trial of Saturday redeemed easily. The vessel is constructed on the longitudinal system, which adds strength to vessels when most subject to strain. This mode of structure has been carried out to its fullest extent in the Great Eastern. In the trial of Saturday the *Cleopatra* was worked by powerful engines, and driven at a speed sometimes of 17 miles an hour, yet the vibratory motion was scarcely perceptible even in the saloons nearest to the engine-room. The whole ship is of iron. Her extreme length over all is 202 feet, breadth 21, and 10½ feet deep. When laden with three days' coals her draught aft is only five feet, and forward only four feet seven inches. The greatest novelty, however, of the vessel consists in her being fitted with engines of perfectly new construction, known as Mr. Scott Russell's Patent Three Cylinder Engine. In the case of the *Cleopatra's* engines all complexity has been removed, and three cylinders are applied through a single crank in such a manner as to occupy smaller space, and have fewer working points than usually go to form an ordinary pair of engines. The practical result is that the uniformity of action is manifest. The rapidity of the stroke is increased, the steam is worked with economy, and the ship attains a high velocity with a small consumption of fuel. In the *Cleopatra* the condensers and air pumps are on one side of the vessel, the engines and cylinders on the other. On Saturday the perfect ease with which all parts of the machinery worked was admired by the engineers connected with marine steam engines who were on board. Though small, and of a nominal 150 horse-power, they work up to 900 horse-power, with a consumption of 21 cwt. of coal per hour, or rather under 2½ lbs of fuel per horse-power per hour. The vessel moved rapidly down the river in spite of a strong head wind and tide, the engines going 40 revolutions per minute, and the result of six runs at the measured mile, now against wind and tides, and then with it, gave an average of rather over 16½ miles per hour. During these runs the engines only varied from 40 against the wind to 42 revolutions with it, excepting at the first run, when sufficient way was scarcely on her at starting, and when the engines only marked 38 revolutions. This run, however, was reckoned with the rest, and the average of the whole gave the high speed we have mentioned. During two runs she was going over 17 miles an hour, and both with the tide and against it turned completely round in twice her own length. The saloons fitted up for the accommodation of the Pasha and his suite have been fitted up with exquisite taste and richness by Mr. Crace. That at the after part, for the accommodation of the ladies of the harem, is a little bijou. The vessel is commanded by Captain Johnstone, who has superintended her equipment, and who will take her out immediately to Constantinople.

TESTIMONIAL TO A MASTER SHIPWRIGHT.

Mr. William Edye, who for many years filled the office of master-shipwright of H.M. Dockyard at Devonport, and was but recently superannuated therefrom, was a few days since presented with a testimonial of respect by the workmen of that establishment, consisting of a silver claret jug and salver, and a handsome gold ring. We print below the address which accompanied these presents, together with the reply of Mr. Edye. The former document evinces somewhat strongly that peculiarly subservient spirit which so often prostrates our Devonport friends lower than we care to see them; but Mr. Edye's reply is a very becoming one:—

"TO W. EDYE, ESQ.

"Respected and honoured Sir,—Your retirement from the position which you have so long and honourably held in this great Naval establishment, is an event which cannot be realized by us with feelings of an ordinary kind; neither can it be allowed to pass as one soon to be forgotten. Our associations with your name and worth, whether as a public officer or as a private gentleman, are of the most endearing and lasting kind. In the former you have united that talent and firmness so necessary in conducting the duties of your high and important office with the best advantage to the public service, and, at the same time, secured to yourself the affection of your subordinates; whilst in the latter, by affording us your kind sympathy and advice in our domestic afflictions, calls forth a voice of heartfelt gratitude from the kindred ties of our nature. You have also, in a great measure, induced habits of economy and self-reliance, which have resulted in the establishment of an institution, which we hope to bear your name, together with that of your benevolent lady and family, in grateful remembrance, down to succeeding generations. We, therefore, hope that your life may be spared for many years to enjoy this testimonial (not for its intrinsic value), but bearing as it does the high esteem of those who, whilst acting in conjunction with your able superintendence, have assisted in raising the wooden walls

of Old England. May they ever prove our effectual defenders. May prosperity reign amongst us and our isle—and when the Disposer of all events shall summon you to your final home, and ere the closing scene of your existence shall arrive, may you then be enabled to resign all those cherished associations which will ever be dear while memory lasts, for that crown of glory which, above all others, is incorruptible, and fadeth not away.

(Signed) "In the name of the Workmen,
"H. Poale, *Chairman.*

"Devonport, Oct. 30, 1858."

In accepting these presents Mr. Edye forwarded the following reply :—

"TO THE WORKMEN OF H.M. DOCKYARD, DEVONPORT."

"In acknowledging the receipt of your invaluable memorial of respect, I feel the greatest pleasure and gratification for such a handsome testimonial of regard; not only for the superb piece of plate and valuable ring, but also for the kind and sympathizing address accompanying it. Such a tribute of esteem produces feelings of no ordinary description mixed with regret and pleasure.—I regret being separated professionally from a large and respectable community with whom I have been associated for the last fifty-eight years, but the pleasure of finding myself so highly respected on quitting public life will ever be in my memory, and your memento will be a heir-loom in my family.

"In expressing my sincere thankfulness for the attention and honour done me, I hope to have the gratification of seeing many of you filling higher stations in the public service than you do at present, and in taking my leave be assured, I shall ever feel interested collectively and individually for your welfare,

"And remain, yours very sincerely,
"W. Edye.

"Devonport Yard, Nov. 1, 1858."

ON AN INSTRUMENT FOR DESCRIBING SPIRALS:

BEING A DESCRIPTION OF A TRAMMEL, CALLED A VOLUTOR, TO DESCRIBE THE SPIRAL OF ARCHIMEDES AND OTHER SPIRALS, INVENTED BY HENRY JOHNSON, ESQ., OF 39, CRUTCHED FRIARS, LONDON.

BY THE REV. J. BOOTH, LL.D., F.R.S.*

The ancient geometers considered the mechanical description of curves as an important geometrical consideration. Euclid admitted no construction whatever except those that might be effected by the use of a right line and circle, that is, by a straight ruler and a pair of compasses. Thus, when it is said that the trisection of an angle and the duplication of the cube are beyond the powers of geometry, nothing more is in reality asserted than the impossibility to contrive a construction—using only right lines and circles—which shall effect the mechanical solution of the problem. If we admit the mechanical construction of other curves, the problems in question are of the most elementary simplicity.

The most celebrated geometers in ancient and mohern times did not disdain to exercise their ingenuity in the construction of instruments for the graphical description of certain curves by continuous motion. Thus the Greek geometer Nicomedes, who lived two centuries before the birth of Christ, in the time of the philosopher Eratosthenes, invented the curve called the Conchoid, which goes by his name, for the purpose of solving the problems I have just now referred to. He also invented a mechanical contrivance for its graphical description, called the Trammel of Nicomedes.

The Cissoid was a curve invented by Diodes, another Greek geometer, as a locus for finding two means proportional between two given right lines; on which depends the solution of the celebrated old problem, the duplication of the cube. Newton did not think it unworthy of his genius to occupy himself in constructing an instrument for describing the cissoid mechanically. It is one of great elegance and simplicity. Sir John Leslie has also invented an instrument for describing another geometrical curve, known as the Tractrix. Instruments have been invented for describing other curves, but, however ingenious they may be, they are of but little practical value. They are matters rather of curiosity than use. But, as the spiral of Archimedes is the type or form according to which architects describe the scrolls or volutes of columns, an instrument to describe the spiral is a help of as much practical value as the elliptic compasses, or the protractor, or the pentagraph. Mr. Johnson's instrument may be briefly described as follows:—

The instrument, which, looking to its practical use, he calls a volutor, consists of a vertical axis resting on a horizontal plane, and retained on it by a metal point, to prevent slipping or lateral motion. To this upright axis is attached one extremity of a horizontal arm or bar. The vertical axis passes through the extremity of the horizontal arm, or a block attached to the end of it, in such a way that the horizontal arm may freely revolve round the vertical axis. The remote extremity of the hori-

* British Association, 1858.

zontal bar is furnished with a drum or pulley over which a band or chain passes. One end of this band is fixed to the centre upon a level with the pulley, and the other end of the chain or band, after passing over the pulley or drum at the outer end of the horizontal rod, returns and is attached to a slide which carries a pencil or marking instrument. The horizontal bar is caused to revolve either by the hand directly applied to it, or by a string wound round a drum attached to the vertical axis. The chain or band is thus wound round the upright spindle on a grooved cone, and the slide is drawn from the centre towards the drum at the other end of the horizontal arm, and thus the curve is traced by a pencil or other point, progressively increasing its radius vector as the slide recedes from the axis. The pencil is inclined towards the centre to compensate for the space required for a flat coil of chain or band round the centre at the junction of the vertical and revolving bars. The addition of small tubes to slide down when required to the junction, with an opening for the chain or band, will afford the means of varying the size of the centre, and consequently the intervals between the successive spires of the curve.

The rectification of the spiral of Archimedes depends on the rectification of the parabola, and reciprocally; for, if we alter the curve so as to make the vectors parallel without altering their inclinations to the several tangents at their extremities, we transform the curve into a parabola, as has long been known.

A NEW APPARATUS FOR COMMUNICATING BETWEEN SHIPWRECKED VESSELS AND THE SHORE.

A circular "On a safety line carrier, invented by M. Pierre Bertinetti, of Turin, and patented in Piedmont, France, England, Austria," &c., has been forwarded to us for notice. M. Bertinetti is known to us as a highly ingenious gentleman, and the inventor of several useful improvements. His new apparatus appears to consist of a wooden shot to which a line is attached, and which is propelled by a feeble charge from a gun on board the ship or on the shore. The inventor says that Manby and others have never been able to throw their lines more than about 200 yards, but that his can be thrown four times that distance. Letters are subjoined from the French Minister of Marine (18 Jan., 1858), and from the Minister of Commerce (29 March, 1858). The former, Admiral Hamelin, says, that the French Government has aided him in making his experiments, and perfecting his invention, and now wishes to give all possible publicity to the fact of its success. He further states, that the apparatus has been found capable of successfully establishing a communication between the vessel and the shore at a distance of 400 yards from whatever point it is thrown; and at the same time gives the inventor an order to supply the Government with twenty new shots in addition to the nineteen already in their possession—not so much to provide for those rare cases in which Government ships need such assistance, as to reward the inventor, and help to defray his expenses. The letter from the Minister of Commerce is a circular, addressed to the members of the Chambers of Commerce in the provinces, recommending the invention to their notice, and suggesting that shipwreck institutions and marine insurance companies should take means to provide the apparatus at exposed and dangerous places on the coasts; informing them also that the Ministry of Marine will do all that lies in its power to assist them. The inventor undertakes to supply his apparatus of various sizes for £12, £16, and £20 each, respectively. His address is, Chez M. le Comte de Molin, 31, Rue d'Amsterdam, Paris.

NOVEL RAILWAY SIGNALLING APPARATUS.

Monsieur Pierre Ernest Aimont, of Paris, has just completed a patent in this country for an arrangement of railway signalling apparatus, the object of which is to afford to drivers of locomotive engines used on railways, indications of their exact position upon the line at any and every point of the journey, of the time of the day or night, and of the speed at which they are travelling, and also to provide means by which either ordinarily or in the event of an accident to a train, or to the permanent way, a signal of danger or otherwise may be given to a train approaching the spot in either direction. And the invention consists in the construction of an indicating apparatus, as follows:—Upon a disc of card or other suitable material are marked, around the circumference thereof, a number of points representing the relative positions of all the stations, crossings, curves, and other places with the positions of which it is desirable that the driver shall be acquainted, these points all being spaced off according to their distances apart, from a starting point which represents the terminus from which the train is to start. The disc thus marked has a central aperture, behind which a watch, clock, or chronometer is placed, so that the face of it may be visible through the aperture, and near the edge of the disc a fixed needle or pointer is placed.

Behind the said needle or pointer the card is made to rotate by means of gearing driven by the axle of the locomotive, the gearing being so proportioned and adjusted that while the locomotive travels from one station to another, the point on the disc which represents the former station shall move from the needle, and that which represents the latter station shall arrive at it. An engine-driver provided with such an apparatus by inspecting the disc will observe the exact position of his train upon the line; by inspecting the time-piece will observe the time; and by comparing the two will observe the speed at which he is travelling. The apparatus being entirely independent of external influences, will not be liable to error or failure from fog, darkness, or other like causes.

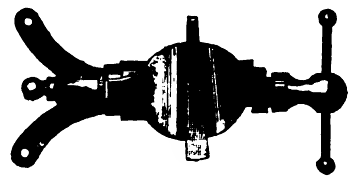
EASTERBROOK AND ALLCARD'S REGISTERED BENCH VICE.

MESSRS. EASTERBROOK AND ALLCARD, of the Albert Works, Sheffield, engineers and tool manufacturers, have registered a very useful bench vice, constructed so as to grasp a tapered object with as much facility and security as a parallel

Fig. 1.

object. Fig. 1 of the engravings is a side elevation of their improved vice, and fig. 2 is a plan, showing a tapered object grasped by the vice. A is the fixed and B the moveable jaw, the limb of which latter terminates at bottom in a ball which fits into a spherical socket in the foot, C, so as to allow that limb to turn as may be required.

Fig. 2.



Practical mechanics will not be surprised to learn that the improved vice is already in large demand.

HILLS' GAS PATENT.

COURT OF EXCHEQUER,

NOVEMBER 13.

(*Sittings in Banco, before the* LORD CHIEF BARON, *Mr. Baron* BRAMWELL, *Mr. Baron* WATSON, *and Mr. Baron* CHANNELL.)

HILLS V. THE LONDON GASLIGHT COMPANY.

This action was tried by Mr. Baron Bramwell at the last assizes for Surrey, when the jury found a verdict for the plaintiff.

Mr. Bovill, with whom was the Hon. George Denman, now moved, pursuant to leave reserved at the trial, to set aside the verdict and to enter it for the defendants, or for a nonsuit or new trial.

The action was brought for the infringement of a patent called "an improved mode of manufacturing gas." The specification referred to the purification of gas from sulphuretted hydrogen by oxide of iron, and for discharging the hydrogen from the oxide when saturated with that substance, for the purpose of its being used again.

The Court was occupied a considerable time by the motion, and granted a rule *nisi*.

BROWN'S "GRAVITY BINNACLE."

To the Editors of the Mechanics' Magazine.

GENTLEMEN.—Having observed that my Patent Gravity Binnacle is noticed in your publication of the 6th inst., I beg you will permit the accompanying description to appear in your next impression, so that the error conveyed to your readers, viz., "that the improvement mainly consists in the

card being transparent and lighting from below," may be rectified.

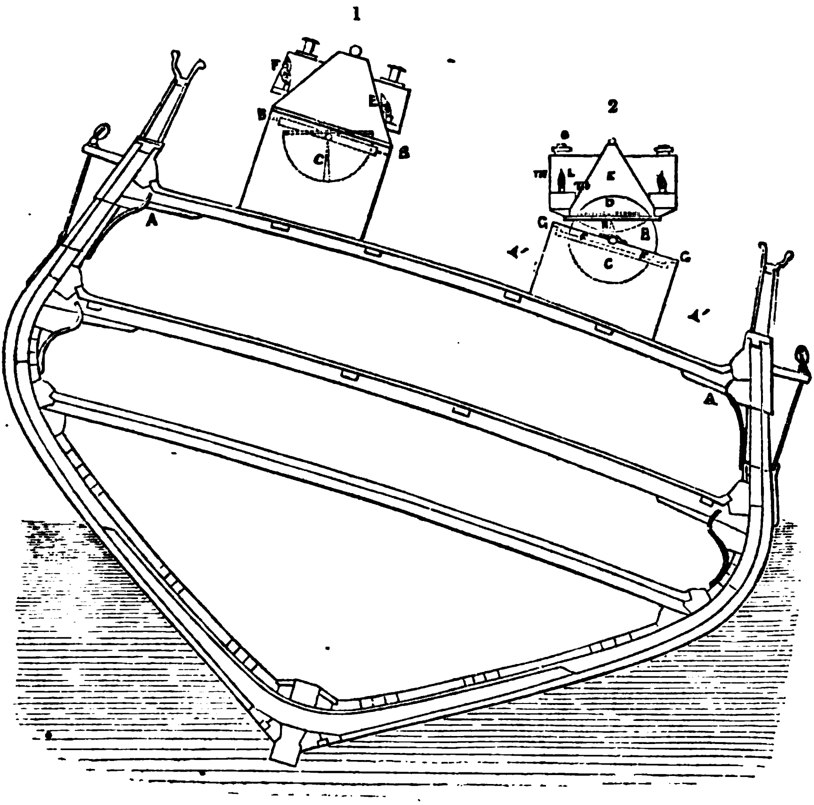
I am, Gentlemen, yours, &c.,

GEORGE BROWN,

25, Wickham-terrace, New-cross, Deptford, S.E.
November 8, 1858.

The improvement of the Gravity Binnacle consists in its always keeping a perpendicular position, and not partaking of the motion of the ship; thereby removing all friction from the compass-card and bowl, and transferring it to the binnacle itself.

The good qualities of a compass are its fineness of manufacture: hence it should be subject to as little motion as possible. Hitherto the binnacle being a fixture to the deck of the ship, the compass card and bowl have received the whole vibration. The upright spindle that rises from the bottom of the bowl to support the card should, at its top, be *as fine as the point of a needle*, shewing that the motion from the latter, which (in the fixed binnacle) works upon the spindle, should be removed. If from a compass that has been a little time in use the card be removed, the top of the spindle will be found to be worn down, and not to have retained its fineness, causing the card to work stiffly, and more variation to take place than is natural to a compass.



When a vessel fitted with the binnacles at present in use is rolling and pitching, the card does not remain stationary, but moves in a circular direction, not showing the true course the ship is steering; for instance, if sailing N.E. the card will move from N.E. towards north, and from that point towards east.

Another great advantage possessed by the Patent Gravity Binnacle is, the illumination of the compass. The flame of a lamp always burns uprightly, and whilst

a ship is in smooth water the light is seen in the binnacle, but when in a sea-way the fixed binnacle rolls and pitches simultaneously with the ship, causing the flame of the lamp (which maintains its perpendicular position) to come in contact with the glass on the *lee side*, as well as the metal work of the lamp on the *weather side*, thus blackening both glasses and metal, and cracking the former, besides choking the lamp with the collected smoke, so much so that frequently the compass is scarcely visible.

These great objections will be found to be completely overcome by the Gravity Binnacle, which, as stated, always preserves its perpendicular position, thus removing the friction from the compass-card, and keeping the flame of the lamp always directly under the chimney, so that the smoke produced by careless trimming, bad oil, or otherwise, will all escape at the top of the lamp, without blackening the glasses, &c.

The accompanying diagram, which represents the section of a ship, will explain more fully the advantages derived from the gravity binnacle.

A, A, is the deck, which is drawn at an angle. The binnacles at present in use (marked 1) being a fixture to the deck, roll and pitch simultaneously with the vessel, causing all the friction to take place at B, B, and the top of the spindle C, (the most important part of the whole compass). The upright spindle, C, should at its top be extremely fine, to allow the card to play freely, but it is quite impossible to be kept so, while the motion is allowed to take place at the points just shown, the result is, the point of the spindle, C, becomes worn down, which, being the point of suspension of the compass-card, causes great variation and the compass to wear out quickly.

In the illumination of the compass-card (an important point) the binnacle not being upright, the flame of the lamp, which *must always be so*, strikes against the glass, E, on the lee side, and the metal work of the lamp, F, on the weather side, filling and choking the lamps with smoke, as well as blackening and cracking the glasses, &c., &c.

The gravity binnacle (marked 2) is constructed in such a manner that it always remains perpendicular, no matter how the vessel is rolling. A′ A′ is a mahogany box, for the purpose of containing the binnacle, B, which is a brass ball, the lower half of which, C, is loaded with lead; the upper part, D, is glass, fixed in a metal ring, for the purpose of fastening it to the binnacle; outside which ring works another with the lamp and gear, E, attached to it—the latter ring is only intended to be shipped at night. F F is a strong gimbal fixed to the mahogany box, in metal sockets at the points G G.

It will now be seen that however much the vessel is rolling, or pitching, the mahogany box will be the only part that moves, the ball, B, having its lower half loaded, will remain perpendicular, the box working on its axis, thereby removing all the friction from the fine point of the spindle, H, to the gimbal, F F, which causes the needle of the compass-card to have little or no wear, and the card itself to remain steady, instead of flying about in a circular direction, as it does in the ordinary binnacles.

Another advantage obtained by the gravity binnacle is, the illumination of the card. The flame, L, does not strike against the glass, M, or the metal work, N, but always burns directly under the chimney, O, where it all escapes, instead of blackening the glasses, &c. &c., as with the binnacles before described.

THE ATLANTIC TELEGRAPH CABLE.

Sir,—I agree fully in the sensible observations made by your correspondent who signs himself "J. T.," in the last number of your useful publication.

Why should these experiments, performed at the expense of the company on their cable, be concealed at least from the shareholders, if from the public? The company have liberally advanced their money for the promotion and advancement of a great national undertaking, and the more publicity is given by their means to any important discovery made in the science, the more will the public stand indebted to the company, and the more likely to have public support in so great an undertaking.

I perceive by an article published also in your last number that Mr. Whitehouse has undertaken to make the present cable effective at his own expense, if he be paid a certain percentage as commission on the messages for the next ten years. Now, certainly if he has made this offer he cannot have been encouraged to do so from the results of any of the published experiments made on the present cable, and therefore it must be from some unpublished experiments he has tried, but not made public.

If an unprofessional electrician, therefore, be permitted to make a suggestion, I could, I think, show in what way, at no expense, the present cable can be made effective; at least it may be the means of having some alteration in the principle of making long submarine cables.

In the early stages of telegraphic com-

munication there were two things to be taken notice of and worthy of consideration. The first is, that two lines of wire were made use of; in other words, the electricity traversed throughout a metallic circuit, and did not, as at present, take to earth; and secondly, the wires were not insulated with gutta percha, and therefore a cable could not be passed through water. Nevertheless, ingenious people found a way to pass messages through water, across rivers, without a submerged wire, or without any wire either above or below water. It is not necessary for me here to explain how this is done, further than to say it requires to have two wires in the telegraph line, and when the extremity of each wire is dipped in the water at a distance from each other more than three times the breadth of the river, the electricity will prefer the shorter passage to cross the river twice and encounter some hundred miles of wire travelling, than to take the longer water course without having to traverse a metal circuit.

When the discovery was made that one wire would be found sufficient by permitting the electricity to take to earth, a great step was made in the improvement of the science, but it has been found when submarine lines are required beyond a certain length, say about fifty miles, it does not work so satisfactorily, and that Morse's instrument cannot work well, if at all, beyond that distance. This is not to be wondered at when it is considered that the electricity has to traverse in that length of cable fifty miles of moist earth, and we see by the experiments mentioned above, where the telegraphs passed rivers, the electricity would prefer passing hundreds of miles over metal conductors than pass the same number of yards of water. My suggestion, therefore, is this; connect the copper and iron wire at Newfoundland, connecting the same to a sensitive indicator, and permit the return current of electricity to travel home, not through 2,000 miles of moist earth, but over an iron road, namely, the wire coil which surrounds the cable. Let messages be sent this way for one half of the day, and by changing the arrangement, the remaining half of the day can be employed in receiving answers and messages from Newfoundland at Valencia. Wishing the company every success,

I am, Gentlemen, yours, &c.,
P. M.

Dublin, 3rd Nov., 1858.

Gentlemen,—When I read your "Old Subscriber's" letter in your Magazine of the 6th inst., I felt very much annoyed to think that after all the promises by the directors there was no improvement whatever in the new cable making for the Red Sea line. It was fully understood by many of the shareholders as well as myself that the best cable that could be found was to be adopted. True, we have both Mr. Newall's and Mr. Brett's word that it will be very superior to the Atlantic cable, but we have had the same assurance before, and what is the fact? half a million of money for ever lost in the bottom of the sea.

Well, is this to be so in the Red Sea? I guess and fear. Of course you will say, "If you dont like it, dispose of your shares;" so I can, but that is not doing any good in furtherance of the most valuable power in the universe, a power intended to link every portion of the human family in one common brotherhood; and yet from some cause or other, we are as far away as ever from accomplishing that great end.

It is very true I am no judge of cables, but thinking your corrrespondent might be misinformed about the construction of the two, I called myself to see the several specimens, and there they are nearly as like as two pins, in principle, only the old one has small wires in strands, the new one solid ones twisted round the soft core instead. We sometimes hear of garotting people: it strikes me that is the principle of this kind of cable. Surely there must be engineers enough to get over the difficulty; depend upon it, if they make another failure with their eyes open, there will be great difficulty in raising money for another line.

I am, Gentlemen, yours, &c.,
W. Clapham.

P.S.—May I ask you how it is they appear so careful about the wires under the pavement, and so careless about the protection of our deep sea cables? Is it not possible to adopt the same means for them also?

TELEGRAPH CABLES.

Gentlemen,—The suggestion of your correspondent "J. M.," to make and lay submarine telegraph cables, though doubtless new to him, is not original.

So far back as 1852, I invented, and in conjunction with my brother patented, "a method of, and machinery for, making and laying submarine telegraph cables, also applicable to the manufacture of ropes."

I have no wish to detract from the merit due to him for the *re-invention*, he evidently being unaware of the existence of my patent; but I consider the proposition as made by him to be of little value, owing to the fact that no such speed of manufacture as four miles per *hour* can be attained by

the ordinary rope-making machines, four miles per *day* being rather above the rate of making by any machine known to him.

Having designed a rope machine in which the reels containing the wire, yarn, or strands, are brought to a stationary position in the centre of a small revolving frame, instead of being moved around the common and their own centre once every lay or twist put into the cable, thus enabling the machine to be worked at a speed hitherto unknown, and limited only by the rate at which the cable could be coiled, it occurred to me that their application on board ship would overcome what was then considered to be a difficulty in laying cables of great length, namely, the enormous space which would be required to stow cables of the size they were then designed.

Negociations were opened by the Messrs. Brett for the adoption of this method, but after some delay they declined it, owing, I believe, to a doubt as to the correctness of the principle upon which the machine was designed, and, at that time, they were not singular in their opinion. However, after a lapse of some time, I offered a license to the eminent cable contractors, Messrs. Glass, Elliot, and Co., who at once comprehended the importance of the invention as a rope-making machine, and adopted it in the manufacture of the Atlantic Cable and rope making. The subsequent adoption by the rope-making trade generally, proves the principle to be correct.

I hope, shortly, to see it tried on board ship, in making and laying simultaneously, as its application on shore has resulted in saving several thousand pounds when used in manufacturing long lengths of cable.

Begging the favour of the insertion of this in the next issue of your valuable publication,

I am, Gentlemen, yours, &c.,

ARCHIBALD SMITH.

62, Princes-street, Leicester-square,
Nov. 9. 1858.

THE SLIDE RULE.

To the Editors of the Mechanics' Magazine.

GENTLEMEN,—If "Enquirer" be an earnest enquirer, he will not object to a little labour to learn "the *principle* of the graduation of lines A and B in the engineer's sliding rule." Let him provide himself with a smooth lath of clean white deal, then take a screw of a fine pitch, and with it mark off at least 2,000 notches on one angle of the lath. With a small square draw a line across the lath at the left-hand notch, mark it 1, and *consider* it 100. Then to find where 101, 102, &c., up to 1,000, will fall, take a table of logarithms, and opposite the numbers 101, 102, &c., will be found the logs. or numbers of the notches. Thus, to find where the line for 200 must fall, I find the log. of 200 to be 3010300, a number too large for our scale, so I take the three first figures, and at 301 notch I draw a line, and mark it 2. The line 3 will be at notch 477, and 4 at notch 602. The line 9 at notch 954, and the short line for 999 at notch 999½. The positions of the lines for the higher number require a little trimming, unless we have 20,000 notches instead of 2,000. Go on in the same manner for the next 1,000, and you have the line A. At first it would, perhaps, be better to mark only the tens—as 110, 120, 130, &c.

Supposing all this to be done, take a pair of dividers, and place one point at 1 and the other at 2; then, on placing one point on any number, the other point will rest on the product of that number by 2; and so of all the other numbers. The log. of 6 is equal to the sum of the log. of 3 added to the log. of 2; and the dividers applied to 1 and 2, then to 3, will reach to 6, because, in doing so, we add the logs. of 2 and 3 together.

If we make another graduation with a screw twice the pitch, the logs. on it will be twice as far from 1; and as the squares of numbers are twice as far also as the numbers themselves, it follows that, on applying the last graduation to the first, we shall have a series of squares and roots, as we find them in the lines C D of the engineer's slide rule. The use of the slide is to dispense with dividers.

A screw cutting lathe may be used for the same purpose of illustration, in the following manner:—Put on change wheels, so that the saddle shall move about a foot for a thousand turns of the mandrel. Mark the bed of the lathe by a scriber applied close to the saddle, and call it 100; then by logs. again find out the turns of the mandrel for the numbers. 101 will take 4 turns, 102 will take 8·6 turns, &c. Not 8·6 turns after marking 101, but after marking 100. By marking the bed with a fine scriber, you will have a very good representation of the lines on a slide rule.

If "Enquirer" should not understand the use of logarithms, let me advise him to direct his attention to the study. Half an hour each evening for a week would be sufficient to enable him to make use of the tables; and a degree of satisfaction would be derived that cannot be had at such a cheap rate in any other part of the field of mathematics.

I am, Gentlemen, yours, &c.,

J. SIMON HOLLAND.

Woolwich.

THE TRAJECTORY, OR SHOT'S PATH THROUGH THE AIR.

GENTLEMEN,—To instruct men in rifle practice, and give a correct idea of the trajectory, or shot's path through the air, I would use a balista, made after the manner of the ancient Greek balista, with an open space in the centre for the ball to pass through, without the necessity of turning up the ends of the bow as with our present steel cross-bows. The flight of a ball shot from a balista is always uniform, because there is no *friction* to cause deflection in its passage through the air.

J. NORTON.

Rosherville. Nov. 13th, 1858.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

NUTTALL, J. *Improvements in looms.* Dated Mar. 25, 1858. (No. 628.)

The patentee claims, 1. A double cone pulley, having steps or recesses of different depths, adapted to a chain of different lengths of links and pins, so that as the pulley revolves the top of the chain will be raised or lowered. 2. A moveable pin and a mode of working it, so as to operate upon two or more intermittent wheels. 3. Giving a lateral motion to the pattern cylinder by a swell and intermittent wheels. 4. The use of two tappet chains for raising and falling the treadles and healds for making the shed; and also the use of a pattern jacquard cylinder, which only revolves on its axis, for governing the motion of the needles and hooks, which latter raise and fall the treadles and healds making the shed.

HAECK, F. *Improvements in pumps for pumping beer, wine, vinegar, oils, or other liquids containing acids or oily matters.* (A communication.) Dated Mar. 25, 1858. (No. 631.)

The barrel of this pump is made of china, &c., and the piston of a cupped leather, or cup of gutta percha, supported by a smaller hollow china cup connected to the piston rod, so that the liquid will pass when the piston is moved in one direction. At one end of the barrel is a pipe connected at its other end with the vessel containing the liquid, and at the other end of the pump barrel is another pipe which conveys the liquid away. These pipes are of glass, and in one of the joints of each pipe there is a valve which permits the liquid to pass in one direction only.

FOUCOU, F. *Improvements in steam-boiler and other furnaces.* Dated Mar. 25, 1858. (No. 632.)

The patentee employs a perforated plate of fire clay, &c., which slants from the top of the front of the furnace to the back a little above the fire bars, by which, when fresh coals are placed in, the smoke, &c., are heated by the perforated plate. To supply air he employs a pipe perforated at its upper part, which passes up the sides and over the top of the front of the furnace, and he places a valve at the end of the pipe by which the air admitted can be regulated.

RICHARDS, W. *Improvements in breech-loading guns and fire-arms.* Dated Mar. 25, 1858. (No. 633.)

A hollow chamber is formed at the breech end of the barrel. The interior of the chamber is made for receiving a cartridge, and so that the cartridge may be slid out into the end of the barrel. The plug used to close that end is attached to a sliding block by a knuckle joint, which block slides along V-guides on the under side of the cover of the chamber. The cover is hinged to the fore end of the chamber, and has a handle which extends back into a recess in the stock, where it is grasped when discharging the piece. The back end of the cover descends beyond the end of the chamber to prevent any flash in a backward direction should the plug fit imperfectly. The block to which the plug is attached is formed with a curved inclined end, so that in coming against the end of the chamber when the cover is shut, it may be forced forward to cause the plug to enter into the breech end of the barrel. When making a breech-loading fire-arm with the breech end of the barrel so formed as to turn upon a hinge or axis to receive the charge, such portion of the barrel is arranged to slide and also to rotate, the forward end of the moving part of the barrel being made to enter the breech end of the barrel.

YOUNG, J. *An improved apparatus for signalling on railways by day and night.* Dated Mar. 25, 1858. (No. 634.)

Here an alarum may be attached to each engine, and connected to an upright shaft fixed at the outside of the weather board. It is raised by coming in contact with a vertical lever which is elevated with a wire rope worked by a lever at the station. When an accident occurs the rope may be drawn, and the lever elevated by the guard, and danger signals be thus given to succeeding trains, a succession of these contrivances being fixed all along the line.

ROBJOHN, W. *Certain improvements in organs.* Dated Mar. 25, 1858. (No. 635.)

This consists in actuating the whole of the stops of an organ by depressing one pedal, and of an arrangement of an index and pointer connected with mechanism by which any composition may be previously set by the organist, so as to come into play at the part of the music where it is wanted without any other effort than that of depressing the one pedal.

CHEVALLIER, F. A. *Improvements in photographic apparatus.* Dated Mar. 25, 1858. (No. 636.)

This comprises:—1. A general arrangement of panoramic apparatus, with independent and contemporaneous rotation of the apparatus itself and of the sensitive plate, to allow the operator to obtain the complete panorama lying around a person. 2. The use of a magnetic or compass table, enabling the operator to fix the geographical position of the landscapes which the proofs represent. 3. The use of special stereoscopes for these new pictures, and the application to those stereoscopes of a transparent band of silk, &c., tinted with all gradations of colours, so as to reflect lines upon the pictures; also the application of internal mirrors to multiply the effects. 4. The application to fans of the pictures obtained by this apparatus, such pictures being circular and radiating towards the centre.

BROOMAN, R. A. *Improvements in weighing machines.* (A communication.) Dated Mar. 26, 1858. (No. 637.)

The object here is to dispense with weights for indicating the weight of the article upon the platform or scale. The platform, &c., is supported upon a combination of levers, which communicate with one end of a pair of arcs or segments, the opposite end of which is connected to a weight. A rod connected to one of the levers causes a pointer to move over a fixed dial, and indicate the weight of the article weighed or its value, or both weight and value.

MOXON, W., J. CLAYTON, and S. FEARNLEY. *Improvements in machinery for paying out electric telegraph cables, ropes, and other like articles.* Dated Mar. 26, 1858. (No. 638.)

This consists in arrangements of machinery whereby a given tension is maintained on the cable payed out, and whereby, should the tension become greater than the cable can bear, the strain itself so acts upon the machinery as to release the brakes and allow the cable to run out freely. We shall probably illustrate this invention shortly.

BERARD, P. H. G. *Applying concentrated collodion to the effect of superseding caoutchouc in waterproofing stuffs of all descriptions for manufacturing garments and wearing articles, and also for applying it over painted surfaces instead of varnish.* Dated Mar. 26, 1858. (No. 639.)

This comprises the following features:—1. Manu-

facturing impervious fabrics or tissues by applying concentrated collodion for obtaining either smooth or figured stuffs, by running the said tissues between suitably heated rollers, the stuffs thus obtained being intended to supersede caoutchouc-covered stuffs, and some kinds of leather. 2. Manufacturing in this way impervious papers intended for bookbinding, furniture hangings, roof coverings, preserving walls from dampness. 3. Spreading concentrated collodion over all surfaces which could receive a coating of oil paint or varnish, and using it as a substitute therefor.

HORTON, J. *An improvement or improvements in the construction of the girders used in the guide framing of gas holders.* Dated Mar. 26, 1858. (No. 641.)

This invention consists in making girders of wrought and cast iron combined, the upper and lower edges being made of angle iron, and the web of plates of cast iron bolted to the bars of angle iron.

BUTT, R. M. *Improvements in the manufacture of night lights.* Dated Mar. 26, 1858. (No. 642.)

The patentee makes the cases of uninflammable material.

DOULTON, H. *An improvement in the manufacture of invert blocks used in constructing sewers and drains.* Dated Mar. 26, 1858. (No. 643.)

This consists in applying a projecting lip at one end of each of such blocks below the upper surface, and in removing a portion of the partition or partitions which divide the under hollow part of such blocks into separate hollow channels, so as to form a recess to receive the lip of the next block.

NEWMAN, J. and J. F. *Improvements in spectacles.* Dated Mar. 27, 1858. (No. 647.)

Here a lower power glass is placed in the lower portion of its frame, by which objects at a distance can be seen. The upper or folding portion contains a different power glass, which, when folded down over the lower portion, makes up the additional power required for near objects.

BUSHELL, J., and T. WRIGHT. *Improvements which make grids for covering openings, through which fuel is deposited in vaults or cellars, self-securing.* Dated Mar. 27, 1858. (No. 650.)

This consists in making grids or covers for openings, through which fuel is deposited in vaults or cellars, with mechanism that takes hold of the under side of the flag stone or frame in which the grid is imbedded when in its correct position.

BURROWS, B. *Improvements in weaving webs or narrow goods, and in ornamenting elastic webs.* Dated Mar. 27, 1858. (No. 651.)

This consists in weaving coach lace, &c., with terry weavings on their surfaces, by constructing looms so as to combine the use of separate terry wires with two shuttles moved simultaneously in opposite directions by means of racks and pinions, or by the peg motion. Another improvement in weaving elastic webs consists in a mode of employing strands of india rubber as warps, such strands being covered with different colours, so that, there being several such strands in a warp, they may be brought to the surface to produce patterns. Another improvement consists in subjecting elastic webs to pressure between rollers, engraved so as to produce embossings.

ELEY, W. T. *Improvements in cartridges.* Dated Mar. 27, 1858. (No. 652.)

A strong case contains the powder, and at the upper end has its diameter enlarged to produce a shoulder all round a short distance from the outer end of the case. The shot is placed in another case within the first. The shot case has affixed, at its outer end, a wad of larger diameter than the case in which the shot is placed. A disc of cardboard of the diameter of the case is placed over the shot. A piece of thin paper is then cemented over the end, so as to secure the cardboard, then the wad is cemented to the cardboard. The wad fits within the first case at its larger diameter, and a piece of thin paper, gummed over the end, retains the wad within the outer case. To the end of the shot case is fixed a piece of tape, on pulling which the shot case, with its wad, is withdrawn, so that the powder can be readily poured into the gun barrel.

WELCH, J. *Improvements in portable railways, and in the means of their application to carriages to facilitate their movements on common roads and other surfaces.* Dated Mar. 27, 1858. (No. 653.)

Railways are here used on each side of the carriage, composed of an endless chain of rails. The bearing wheels which run upon the railways are each double, having flanges inside and outside, and are composed of two sets of spokes and felloes, with an interval between. Each railway is supported and guided round the bearing wheels by two wheels or drums placed anteriorly and posteriorly between the sections of the double bearing wheels.

BURQ, J. A. V. *Improvements in weighing machines.* Dated Mar. 27, 1858. (No. 654.)

The patentee claims, 1. An arrangement in which the burden is distributed between two or more springs, producing their effects in contrary directions to each other, so as to form a spontaneous compensation, the effect of which is shown by dial plates. 2. Having the dial hands, division points, or marking pegs on the various dial plates easily moveable by hands; for thus allowing one to shift their respective position, but so that constantly a suitable relation shall exist between the various indicators. 3. A mode of indicating the weight on several dial plates, the divisions of each of which bear a certain relation with those of the remaining ones, thereby indicating either the subdivisions or the multiples of a unit of weight taken in one of them. 4. Combining with the above instruments a system of levers for increasing or decreasing the unit of indication. 5. An arrangement for increasing the distance between the marking points by causing the hands to perform more than one revolution over the dial plate. 6. The application of the instruments, and of the principles on which they are based, for obtaining weighings with ordinary scale balances, weighbridges, cranes, &c., in which the weight of the burden or an effect of traction are to be ascertained.

GILBEE, W. A. *Improvements in treating saccharine fluids.* (A communication.) Dated Mar. 27, 1858. (No. 655.)

This consists in the application of alcohol and agents capable of effecting, in conjunction with alcohol, the elimination of mineral or organic matters, which are mixed with the sugar in the juices of sacchariferous plants.

GILBEE, W. A. *Improvements in treating brandies and other spirituous liquors for improving their quality.* (A communication.) Dated Mar. 29, 1858. (No. 657.)

This consists in the employment of hygrometric substances, and by preference of a concentrated solution of carbonate of potash, for abstracting the water combined with alcohol in brandies and other distilled spirits for the improvement of the same.

GARNETT, W., C. GELDARD, and J. DUGDALE. *Improvements in looms for weaving.* Dated Mar. 29, 1858. (No. 658.)

This consists, 1. In an improved self-acting let-off motion, by which the yarn on the warp beam is let off when the tension becomes too great; 2. In the application of a fixed bearing at each side of the loom to hold the lease rods. These cannot be described without engravings.

BRECKON, J. R., and R. DIXON. *Improvements in the construction of coke ovens.* Dated Mar. 29, 1858. (No. 659.)

This consists in constructing coke ovens with flues or tubes, through which air is conveyed into the chamber of the oven, whereby it is partially heated and rarefied before it mixes with the aqueous and inflammable gases evolved by the coals.

CHADWICK, W. *Improvements in the hoods or tops, and in the footsteps and bearings, of ventilators.* Dated Mar. 29, 1858. (No. 660.)

The hoods or tops of ventilators are here made

with vanes in diagonal directions, so that the current of air, in passing through, imparts a rotary motion to the hood or top. The improvements in the footsteps and bearings consist in making them of glass.

SPENCER, J. F. *Improvements in marine engines.* Dated Mar. 29, 1858. (No. 661.)

This relates, 1. To the combination of an ordinary injection condenser with a metallic surface condenser, in which the cooling liquid is drawn or forced through small oval tubes by a pump. 2. To an arrangement of marine engines in which the steam cylinders are inverted over the main propelling shaft, and connected directly to the same. The patentee adds an inverted steam cylinder over each air pump, connected directly to it. He attaches this cylinder to the castings forming the cylinders or standards of the main engines, thus combining the main and air-pump engines in one construction. 3. To the addition of a piston-rod to the upper side of the piston to pass through a stuffing-box in the cylinder cover. This rod is to be of such a diameter that the difference of pressure on the two sides of the piston shall equal the weight of the piston and rods and cranks connected therewith. 4. To the addition of auxiliary boiler power to work all assistant engines attached to, and working, the air pumps of marine engines, one advantage of such arrangement being the power of using high-pressure steam in the auxiliary boiler.

HORTON, J. *New or improved machinery to be employed in punching metals.* Dated Mar. 29, 1858. (No. 662.)

This consists of machinery in which the metal to be punched is moved under the punching machine by a travelling table, moving with an intermittent motion, the distance through which the table travels between the periods of rest during which the punching is effected being regulated by a template or series of pattern holes.

BAILLIE, J. *An improved construction of coiled spring.* Dated Mar. 29, 1858. (No. 663.)

This relates to the manufacture of coiled springs from plates of steel of equal breadth from end to end, but tapering in thickness.

DURAND, I. C. *An improvement in the manufacture of chain cables.* Dated Mar. 29, 1858. (No. 664.)

This consists in filling up the centre of each link with a block. The two ends of the block are formed with a hollow curve, to correspond to the curve of the adjacent links.

BROWN, I. and J. *Improvements in the manufacture or production of manure.* Dated Mar. 29, 1858. (No. 665.)

The patentees employ a compound, composed of sulphuric acid and charcoal, which, on being mixed with guanos, fixes the volatile ammonia therein, renders the phosphates soluble, improves the fertilising properties, and reduces the cost one-third. It is also applied to the dissolving of ground bones, bone dust, &c.

JACQUIN, E. A. *An improvement in preparing plates for printing.* (A communication.) Dated Mar. 29, 1858. (No. 667.)

This consists in covering the printing surfaces, whether intaglio or relief, and whether of copper or other soft metal, with a very thin and uniform coating of iron, by the electro metallurgical processes.

DAVIS, W., and T. HARPER. *Improvements in apparatus for cutting soap.* Dated Mar. 29, 1858. (No. 668.)

Here a combined apparatus is arranged so that the whole of a frame of soap is at one operation cut into slabs, and at another divided into bars.

HARDING, W. *Improvements in revolver fire-arms, and in apparatus for manufacturing projectiles.* Dated Mar. 29, 1858. (No. 669.)

This relates—1. To the arrangement of the locks of revolvers. The fire-arm to which the improved lock is attached may be discharged by raising the hammer by hand, so as to cock the piece previous to discharging it by pulling the trigger; or the piece may be discharged without previously cocking it by a continuous pull on the trigger. This object is attained by means of a new arrangement of parts, which cannot be clearly described here. The invention also consists in a method of arranging the rammers of revolver fire-arms. For manufacturing projectiles of lead the patentee employs apparatus consisting of a chamber of the form of the projectile to be formed. From the side of this chamber a portion is removed, and at this point a steel cutter is fixed to it longitudinally. To produce a projectile, the end of a rod of lead is introduced into the chamber, and by revolving it the cutter is caused to remove the superfluous metal; when the end of the rod is brought to the proper form, another cutter projected forwards by a spring is allowed to descend to separate the projectile from the rod.

ROBINSON, F., and E. COTTAM. *Improvements in hydrostatic and other presses.* Dated Mar. 29, 1858. (No. 670.)

This consists in using a strong box for the reception of the goods, having a moveable end or bottom, as the case may be, upon or against the end of the piston, to which sufficient stroke is given to admit of its moving the bottom through the entire height or length of the box, for pressing the goods submitted to its action, and for charging and discharging the same with facility and dispatch.

DURAND, J. C. *Improvements in the manufacture of iron.* Dated Mar. 29, 1858. (No. 671.)

This consists in so combining the bars or plates, or elements of the pile, that each of them shall occupy in the finished article the position most favourable to the exercise of its maximum strength.

WEALLENS, W. *Improvements in parabolic governors, and in the mode of applying the same to steam engines.* Dated Mar. 30, 1858. (No. 672.)

This relates to mechanism for preventing an excess of momentum in the balls of parabolic governors during their rising or falling motions, and consists in the use of an air cylinder similar to the "cataract" employed in pumping engines; or in lieu thereof a spring or weight, the action of which will be to offer resistance to the balls when they change their height.

SILVER, T. *Pulsating valves or governors.* Dated Mar. 30, 1858. (No. 673.)

This relates to the application of a spring, counter weight, &c., to a throttle valve for regulating the admission of steam to steam engines, and consists in so arranging a single or double disc throttle valve, as being hung, suspended, or made to work eccentrically, or otherwise unbalanced, enables the over-balanced portion to affect the portion of the valve during the passage of the steam, in accordance with the difference existing between the greater or lesser surface; but such action is resisted by a spring, which may be attached to an external lever, wheel, or pulley, fitted upon the valve spindle.

STEVEN, T., T. REID, and T. FREW. *Improvements in making moulds for casting.* Dated Mar. 30, 1858. (No. 674.)

This invention cannot be described without engravings.

OLDFIELD, W., and T. O. DIXON. *Improvements in gas burners.* Dated Mar. 30, 1858. (No. 678.)

This relates to the application over the slits of gas burners of a cap, forming a chamber with a slit or openings therein, so that the gas passes from the first opening or openings into a chamber, thence through a slit or openings therein to be ignited.

GATTY, F. A. *Improvements in treating certain compounds containing the colouring matter of madder.* Dated Mar. 31, 1858. (No. 679.)

When a solution of the colouring matter of madder, containing at the same time soap or a fatty acid, is precipitated with an earthy salt, insoluble compounds are formed consisting of the colouring matter of madder, the fatty matter and the base of the earthy salt used in precipitating the colour. Now this invention consists in making the said

compounds available for printing by purifying them, setting the colouring matter at liberty, and rendering it soluble in alkalies. The patentee takes 200 lbs. weight of one of the above-named compounds, and mixes it with about 200 gallons of water, to which are added 40 lbs. of carbonate of soda. The whole is then heated and boiled for half an hour; the mixture is then run into a filter, where it is left to drain. When all the liquid has drained off, the solid matter is taken from the filter, and mixed with 30 lbs. of muriatic acid of commerce, with which it is left until the colouring matter which, at first, partly dissolves with the base, is reprecipitated, and the liquid when filtered is colourless. When the acid has produced its effect the whole is put upon a filter, where it is washed with water until free from any acid; the precipitate is then dissolved in ammonia, &c. This process is susceptible of modification.

MUSGRAVE, J., jun. *The application of the heat from the furnaces of singeing or dressing plates to generating steam and drying purposes, and improvements in the construction of such furnaces.* Dated Mar. 31, 1858. (No. 680.)

The flues of the furnaces of singeing or dressing plates have heretofore been in direct communication with the chimney, and the products of combustion after heating the plates were wasted; this invention consists in applying these products of combustion to heat, a boiler for generating steam, or a drying apparatus. The improvements in furnaces consist in surrounding the fire grates or flues of such furnaces with water chambers, or placing such fire-grates within a small steam generator, to absorb and apply beneficially a portion of the heat required for heating the plate.

MERCER, J. *Improvements in the manufacture of leather.* Dated Mar. 31, 1858. (No. 686.)

This relates to those processes known as scouring and stuffing. The patentee claims a revolving drum or mill with pegs, boards, or their equivalents, on the same periphery, in connection with the use of atmospheric air and stuffing heated to certain temperatures. The invention cannot be described without engravings.

EDWARDS, F. and W. *Improvements in weaving.* Dated Mar. 31, 1858. (No. 687.)

The object of this invention is to prevent the necessity of using a rising and falling shuttle-box, and to substitute a fixed shuttle-race, or fixed shuttle-races, on the top of the case or box containing the slides and other working parts connected to an ordinary narrow fabric weaving loom; also to pass the shuttles through the same shed as in an ordinary single batten loom. The shuttles employed in carrying out this invention are of improved forms, each one carrying a quill supported in an opening as in ordinary shuttles. The invention cannot be fully described without engravings.

NAPIER, H. *An improved process in the production of volatile oil of resin.* Dated Mar. 31, 1858. (No. 688.)

The patentee takes the "pinate" and "sylvate" of soda, or the colophonate of soda, and puts it into a still, connects the still with a condenser, and applies heat to effect distillation. The distillate is a brownish yellow fluid, consisting of the volatile oil of resin and a little tarry matter. By repeated rectification, the volatile oil may be obtained free from impurities. The other products are water (not acidulous) and incondensible gases. The residuum in the still consists of a light coky mass containing the alkali employed and charcoal. It is desirable to fill the still to not more than one-fourth of its capacity, so as to render it less liable to "run foul."

PETER, R. *Improvements in gill machinery for the preparation or manufacture of textile materials.* Dated Mar. 31, 1858. (No. 690.)

This consists in the following arrangements:—1. A radial drop action. 2. Superior strength in the bar. 3. Great speed in working. 4. Reduced first cost. 5. Reduction in wear and tear. The bars carrying the gill teeth have their ends fitted into holes in a pair of flanged guide rings carried by spur wheels running loose upon a horizontal dead or stationary shaft. The revolutions of these rings carries the gills round in working, and the exact course to be pursued by them is secured by the action of a pair of differentially curved cam guides keyed fast on to the intermediate portion of the shaft. As each gill bar comes round and approaches the drawing and dressing rollers, it has a radial drop imparted to it by the peculiar contour of the cam guides, over the peripheries of which the bars work, operating in conjunction with the crank action of the ends of the bars. The bars are prevented from touching the drawing roller by a curved guard, whilst at the same time they approach very close to the roller. As the bars proceed in their circuit they are returned to their proper working position by a back guide.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

ELLIS, G. H. *Improvements in kitchen ranges.* Dated Mar. 25, 1858. (No. 629.)

1. The inventor divides the flue passages into two parts, the one leading the smoke directly from the top of the fire over the crown of the oven to the chimney; while below the partition the heated air and products of combustion other than smoke descend in the space next the side of the fire, and pass by flues below at the back and other side of the oven, and thence to the chimney. 2. He separates the oven from the fire by plates forming louvres against which the body of the fire rests, and whereby the passage (for smoke, &c.) through them can be increased or diminished. 3. He forms the crown of the ovens of ceramic substances ribbed or fluted. 4. In making an open or close fire in kitchen ranges, above the fire he forms the top of the range of two hinged flaps, extending from the back half-way towards the front. The front part of the close top above the fire is in one piece from side to side.

NEWTON, W. E. *Improvements in the means of, and lamps for, burning certain kinds of oils and hydro-carbons.* (A communication.) Dated Mar. 25, 1858. (No. 630.)

This consists in substituting a current or blast of gas for that of air, heretofore passed through the flame emanating from heavy oils or hydro-carbons in an ignited state.

PARKES, J. *An improvement or improvements in eyelets.* Dated Mar. 26, 1858. (No. 640.)

This consists in making eyelets of one piece by stamping, pressing, or casting from metal, horn, &c.

NEWTON, W. E. *An improved machine for performing the addition of numbers, quantities, or sums of money, to be termed the "arithmometer."* (A communication.) Dated Mar. 26, 1858. (No. 645.)

This machine is composed of a system of indicating wheels numbered on their peripheries, and geared together, and a system of keys representing the numerals arranged to be operated by the fingers to produce the movements of the indicating wheels. The most important features of the invention consist in the means employed to combine the keys with the indicating wheels to produce the movements of the latter; also the means of controlling the movements of the keys so that neither of them may produce any greater movement of the indicating wheels than is required by the numeral it represents; also in providing for the shifting of the indicating apparatus relatively to its driving gear, so that the motion may be imparted from the said gear to the units wheel, or wheel representing the smallest quantities or values, or to either of the wheels representing greater quantities or values. And further, in a certain improvement in the gearing of the indicating wheels to impart the necessary movement from the index-wheel of any denomination to that of a higher denomination.

JEANNE, V. F., and E. M. G. MARTIN. *A machine for breaking stones.* Dated Mar. 27, 1858. (No. 646.)

This machine is composed of several hammers, disposed similarly to the tilt hammers used in forges. A block of iron is placed under each hammer to receive the blows. A frame is placed to keep the stones under the hammers. One side of the frame is connected with the end of a table, the sides of which form a case in which the stones are deposited. These descend upon an open grate, moved by an endless chain, which takes the stones under the hammer. The lateral movement of this chain pushes the broken stones into a shoot, which discharges them into wagons, &c.

JONES, E. C. *Improvements in railway brakes.* Dated Mar. 27, 1858. (No. 649.)

The inventor proposes, without dispensing with the ordinary brake, to apply an extra braking power, carrying the pressure to the inner side and partially upon the top of the rails by apparatus composed of connecting rods, cog-wheels, and chains connecting the brake wheels with the guard's wheel, and other mechanical parts, the whole to be worked by the ordinary brakes, or so intimately connected thereto as to work simultaneously.

PATERSON, G. *Improvements in apparatus for effecting the combustion of fuel and the consumption or prevention of smoke, applicable to boiler furnaces.* Dated Mar. 29, 1858. (No. 666.)

According to one arrangement, where the boiler is cylindrical with two parallel internal flues, but with the furnaces disposed externally, the boiler is surrounded with double-storeyed brick flues, the two furnace doors being set in the lower part of the brick work at the front end. The fuel is thus supplied through the lower section of the flues, to reach the two furnaces, which are fired alternately. The products of combustion from the newly-charged furnace pass over a hollow, or cellular brick bridge at the back of the grate (fitted with an adjustable air valve), then along beneath the bottom of the boiler on that side, and then laterally across by a passage at the after end of a central bottom water space, which forms the division of the furnaces and bottom flues. Here the current reaches the bottom flue space on the opposite side, and thence passes back along that space over the bridge and into the other furnace, which is then in a clear incandescent state. The current next passes onwards through the lower section of the external brick flues, thus reaching the internal boiler flue on that side, and passing along it to the back end of the boiler. There it enters a cross end flue, which conveys it into an external brick flue passing all round the boiler, finally terminating in the chimney. The two internal flues of the boiler have their after ends which open into the cross back end flue chamber governed by a pendulous swinging valve, having an upright weighted tumbling lever set on a stud in the boiler end, and so arranged that it covers each flue end alternately. At the front of the furnace are two chains with handles which pass back along each side of the boiler round pulleys to reach the lever of the adjusting valve, so that by pulling one or other of these chains the engine attendant can at once adjust the back valve, the result being that the entire course of the current before described is reversed as each furnace is freshly fired.

WOOD, B. *Improvements in machinery or apparatus for cleansing the waste of woollen or other fibrous manufacture.* Dated Mar. 30, 1858. (No. 675.)

Here the woollen or other waste is placed upon an endless travelling belt, which carries it to a pair of feeding rollers, through which it passes to the main cylinder. This cylinder has a roller and clearer similar to those of a carding engine. The cylinder then carries the waste under a partition to a roller covered with strong wire, cards, &c., which raises the hard substances to the surface of the main cylinder. The material then passes forward to the doffing cylinder, which revolves at a slower rate than the main cylinder, and works in close contact with it. At this place all the rags, &c., are separated from the available fibres, the hard substances being thrown under the machine by another roller underneath, between the main cylinder and the doffing cylinder. The material is ultimately stripped from the doffing cylinder by a doffing roller covered with emery, &c., which also keeps the cards of the doffing cylinder clean and pointed. The material thus stripped falls down a sloping doffing board.

WHITEHEAD, W. G. *A new or improved waterproof paper.* Dated Mar. 30, 1858. (No. 676.)

This consists of a paper made waterproof by a composition formed of gutta percha, india rubber, shellac, and resinous matter.

NEWTON, W. E. *Improvements in the manufacture of sheet iron.* (A communication.) Dated Mar. 30, 1858. (No. 677.)

This consists in rolling the iron in its manufacture into sheet iron in a bath of pulverised iron ore or ores of zinc, manganese, or other metals, or of earthy matters which are partly decomposed by contact with the heated iron, and which by such partial decomposition are caused to re-act upon the iron. The object is to regulate the oxidation or formation of scale upon the same.

WESTHEAD, M. B., and H. BAINES. *Certain improved apparatus for coupling or connecting carriages, wagons, trucks, vans, and engines, used or employed upon railways.* Dated Mar. 31, 1858. (No. 681.)

This consists, 1. In employing a hook or rack (with the necessary springs, levers, and wheels attached) which is projected into a trumpet or funnel shaped mouth; this funnel has flanges or shoulders inside to receive the hook or rack. Each carriage will have at either end a funnel and hook, or rack, so that they will fit when the carriages are reversed in their direction. The funnel hook or rack will be secured upon the bar to which the present hook and shackling are attached. By this arrangement the carriages can be coupled and uncoupled without an attendant going between the rails. 2. In the use of a rack and pinion, or screw and mitre wheels, in connection with a ratchet wheel or shaft for tightening and slackening the buffers.

DUCE, J. W. *Improvements in locks and latches, and in attaching knobs to locks and latch spindles.* Dated Mar. 31, 1858. (No. 682.)

These consist, 1. In giving to one or more of the tumblers of a lock a compound action, the tumblers having the ordinary motion upon a centre; and in addition thereto, a motion whereby the plane in which the tumbler is situated is changed. 2. In the use of an additional tumbler having an independent centre, in which tumbler a second stump on the bolt works. The improvements in latches consist, 1. In making the follower to act upon a lever jointed at one end, the end of the said lever acting upon the free end of a balance-latch motion or second lever, jointed at or about its middle to the lock case. The other end of the last-mentioned lever is connected with the latch bolt. 2. In making a tongue in the upper or lower side of such latches as have a double bevel, for enabling them to open in either direction. The improvement in attaching knobs to spindles consists in making a groove on one side of the square spindle, the said groove being narrowest at the end of the spindle, and gradually widening towards the middle of the spindle. The knob slides upon the spindle, and a screw passing through the neck of the knob, and having a taper end, engages in the said grooves.

TODD, E. H. *Improvements in apparatus for generating steam in steam boilers by means of gas.* Dated Mar. 31, 1858. (No. 683.)

Here there is an inlet pipe (or pipes) for the gas below the boiler, in which is inserted a series of sets of burners, the flame of ignited gas from each of which is intended to pass into a metallic tube flue passing upwards through the body of water to be evaporated.

WHITEHEAD, J. H. *Improvements in making woollen bags.* Dated Mar. 31, 1858. (No. 684.)

Here woollen yarn is employed for weaving tubular fabrics of the diameters desired. Closing the end of each bag is done either in the loom by throwing in shoots of woollen weft, so as to weave the warps into one fabric, or the fabrics are run across by hand.

CROKER, B. W. *Improvements in axle boxes, to render them self-lubricating.* Dated Mar. 31, 1858. (No. 685.)

The inventor attaches circular plates to the outer end of the axle, either flat against the same, or secured by studs. These plates dip into the oil, and revolve in an oil chamber while the carriages are in motion, and by these revolutions convey oil to the axle.

JOHNSON, J. H. *Improvements in articles of buoyancy, to be used either for swimming or for the saving of life from drowning.* (A communication.) Dated Mar. 31, 1858. (No. 689.)

This relates to waterproof swimming dresses and belts, and consists in forming a hood upon the dress for protecting the head of the wearer. The improvement in belts consists in closing pads of compressed cotton within an outer casing of strong cloth, having openings made therein for introducing the pads. By this means the deterioration of the belt by reason of the extreme tension to which it is subjected is avoided. To increase the propelling power of the swimmer, the inventor proposes to employ paddles or small flat boards to be fitted to the feet of the swimmer, and attached by cords to the body.

BARR, R. *Improvements in machinery or apparatus for making rivets, spikes, nails, and screw blanks, and similar articles in metal.* Dated Mar. 31, 1858. (No. 691.)

This machinery consists of a vertically-acting ram or presser, actuated by an overhead cam carried upon a horizontal shaft.

PROVISIONAL PROTECTIONS.

Dated September 1, 1858.

1988. A. V. Newton, of Chancery-lane. Improvements in the manufacture of alumina. A communication from M. Le Chatelier.

Dated October 12, 1858.

2270. L. Wray, of Devonshire-st., Portland-pl., gentleman. New and improved compounds for the coating or insulating of submarine electric telegraph wires, and which are also applicable to the coating or insulating of electric telegraph wires laid underground.

Dated October 14, 1858.

2290. J. R. Smith, of Glasgow, gentleman. Improvements in apparatus for propelling boats and vessels.

2292. W. Clark, of Chancery-lane. Improvements in tanning hides, and in apparatus employed therein. A communication from A. L. A. Favier.

Dated October 16, 1858.

2312. J. P. Gillard, of Paris, civil engineer. Improvements in generating hydrogen, and in the means of, and apparatus for, applying the same to lighting and heating purposes.

Dated October 19, 1858.

2336. W. Gossage, of Widnes, chemist. Improvements in the utilization of alkali-waste.

Dated October 26, 1858.

2385. A. V. Newton, of Chancery-lane. Improved machinery for pulverizing, kneading, pressing, and moulding clay and other plastic materials. A communication.

Dated October 27, 1858.

2387. B. Goodfellow, of Hyde, Chester, engineer. Certain improvements in steam engines.

2388. J. Luis, of Welbeck-st. A new syphon water-wheel, receiving its water without destroying the water level. A communication.

2389. J. Luis, of Welbeck-st. A new machine for boring. A communication.

2390. J. Bleakley, of Accrington, machinist. Improvements in boilers, flues, and the methods of fixing the same.

2391. A. P. A. Beau, of Regent-st. A pocket stereoscope.

2392. J. Kinsey, of Brighton, engineer. Improvements in steam engines and pumps.

2393. C. Cheyne, of Great George-st., Westminster, civil engineer. Improvements in the construction of floors and ceilings.

2395. G. Speight, of Woodbridge-st., Clerkenwell, artist in hair. Improved plaits and curls or ringlets for head dresses or ornaments or additions to the natural hair, and an improved apparatus for the manufacture of curls or ringlets.

2396. M. Mason, of Manchester, machinist. Improvements in letter-press printing machines.

2397. P. G. Gardiner, of New York, mechanical engineer. Furnaces for reheating steel, preparatory to hardening, tempering, or annealing.

2398. T. Almond, of Paddington, engineer. Improvements in furnaces for the better combustion of smoke.

2399. J. W. Mott, of Lea Bridge-road. Improvements in pouches of india rubber for holding tobacco or other substances.

Dated October 28, 1858.

2400. D. Varley, of Over Darwen, Lancaster. An improved picker for looms.

2401. G. M. Casentini and J. O. Barnard, of Lambeth, architectural modellers. A certain composition to be used in the manufacture of articles composed of or made with plaster of Paris and other similar substances.

2402. P. G. Gardiner, of New York. A new and useful apparatus for cooling and preserving an equable and low temperature in the oil or composition, or other fluid mixture used for the purposes of tempering, annealing, or hardening steel.

2403. J. Westerby, of Upper Aspley, Huddersfield, engineer. An improved application of steam to vessels filled with oil, tallow, or other materials for lubricating the cylinders of steam engines of high or low pressure.

2404. C. Pooley, of Manchester, cotton spinner. Certain improvements in and applicable to carding engines and other machines for preparing cotton and other fibrous materials.

2405. T. Railton, of Manchester, manufacturer. Improvements in the apparatus employed in the manufacture of cap or bonnet fronts.

2406. A. Heywood, of Manchester, paper maker. Improvements in machinery or apparatus for suspending paper and woven fabrics to be dried. A communication.

2407. J. Evans, of Nine Elms, engineer. Improvements in lubricating the slide valves and pistons of steam engines, and in apparatus for this purpose.

2408. B. Foster, of Denholme, near Bradford, spinner, and P. Smith, of Keighley, machinist. Improvements in machinery or apparatus for spinning and doubling wool, alpaca, mohair, cotton, silk, flax, and other fibrous substances.

2409. W. Munro, of Bartholomew close, manufacturing chemist. A new manufacture of capsules and other metallic articles.

2410. J. Smith, of Bristol, horse-hair seating maker. Improved hats and coverings for the head.

2411. W. Hall and A. Wells, of Erith, india-rubber web manufacturers. Improvements in electric telegraph cables, and in machinery employed in the manufacture thereof.

Dated October 29, 1858.

2412. P. Brunon, of Paris, manufacturer. An improved mode of manufacturing cocks.

2413. W. Kirrage, of Bermondsey New-road, surveyor. An improved elastic combination of materials impervious to atmospheric influences, as a substitute for hard woods, metal, leather, or felting, and for other purposes.

2414. J. Dransfield, of Oldham, hat manufacturer. Certain improvements in cocks, taps, or valves.

2415. P. Wright, of Dudley, manufacturer. Improvements in the manufacture of anvils.

2416. W. E. Newton, of Chancery-lane. An improved method of attaching wheels to the axles of railway carriages. A communication.

2417. J. Dixon, of Jersey city, U. S. A. A method of manufacturing steel.

2418. J. Wright, of Bridge-st., Blackfriars. An improved application of machinery to be used as a new motive propelling power. A communication.

2419. G. Zanni, of Barnet. Improvements in arranging magneto-electric machines for medical and other purposes.

2420. R. W. Chandler, of Bow, engineer, and T. Oliver, of Hatfield, farmer. Improvements in agricultural apparatuses for ploughing and otherwise operating upon land.

2421. R. A. Brooman, of 166, Fleet-st., London, patent agent. Improvements in obtaining motive power. A communication from J. Vanossi.

2422. L. J. Lewis, of Birmingham, jeweller. Certain improvements in fastenings for ladies' dresses and other such like purposes, as also in the machinery for manufacturing the same.

2423. J. Morris, of Broughton, Salford. Improvements in the manufacture of rollers or cylinders for printing fabrics.

2424. J. Drummond, of Cameron bank, Midlothian, farmer. Improvements in reaping and mowing machines.

2425. J. H. Johnson, of Lincoln's-inn-fields. Improvements in photography, and in the apparatus connected therewith. A communication.

Dated October 30, 1858.

2426. R. J. Coningsby, of London, engineer. Improved apparatus for turning over the leaves of music or of books.

2427. E. T. Hughes, of Chancery-lane. Improvements in machinery or apparatus to prevent railway accidents. A communication.

Dated November 1, 1858.

2429. G. Davies, of Serle-st., Lincoln's-inn. Improvements in machinery for weaving velvets and other piled fabrics. A communication.

2431. H. H. and W. F. Henson, of Parliament-st. Improvements in the manufacture and treatment of starch for domestic purposes.

2433. J. Cariss, of York. An improved safety switch box and gear.

2435. C. Perley, of New York. Certain improved means for disconnecting boats from the davit blocks, and effecting other like objects.

NOTICES OF INTENTION TO PROCEED.

(From the "London Gazette," November 16th, 1858.)

1494. J. Billing. Fireplaces.
1498. W. Bond and T. Standing. Churning, &c.
1505. E. Haeffely. Oxides of manganese.
1515. H. Hughes. Gauffering and crimping machines.
1517. J. Davis and T. Evans. Steam engines, &c.
1518. J. Buchanan. Propelling vessels.
1519. W. A. Smith. Bricks, tiles, &c.
1534. P. F. Demoulin and J. Cotelle. Treating heavy oils.
1535. T. T. Chellingworth. Steam engine.
1536. P. R. Hodge. Brewing.
1546. G. Parsons. Steam boilers.
1549. C. N. Kottula. Manure.
1551. J. M. Rowan. Wrought-iron wheels and bosses. A communication.
1553. A. Porecky. Whalebone, horn, &c.
1555. W. Langshaw. Weaving.
1565. N. Defries. Measuring gas.
1567. T. Earnshaw. Night lights.
1581. R. Burns and J. Rea. Grinding bones, &c.
1588. T. Wheeler. Washing, wringing, and mangling machines.
1597. H. Bevan. Arithmetical operations.
1601. W. E. Newton. Giving alarms in case of fire. A communication.
1607. P. Arkell and A. Melhado. Submerging cables.
1611. W. A. B. Bennett. Military capes.
1615. W. Wildes. Pulp.
1633. J. Shand. Fire engines and pumps.
1644. J. W. Wilson. Turning wood, &c.
1655. W. L. Thomas. Ordnance and fire-arms.
1703. W. E. Newton. Gas meters. A communication.
1713. G. S. Parkinson. Railway breaks and signals.
1723. C. and F. Schiel. Hydro-extractors.
1757. J. Shaw. Pasteboard.
1815. W. E. Newton. Twisting wool. A communication.
1822. M. Moses. Umbrella sticks.
1982. W. Pursall. Percussion caps.
2061. L. Hill. Lowering chains and anchors.
2105. J. Luis. Shoes, boots, &c. A communication.
2331. J. Owen and H. Duckworth. Looms.
2336. W. Gossage. Alkali waste.
2344. T. Twells. Embroidering fabrics.
2347. C. C. Alger. Cupola furnaces.
2368. E. C. Shepard. Electric lamps. A communication.
2373. W. E. Newton. Telegraphic apparatus. A communication.
2401. G. M. Casentini and J. O. Barnard. Composition to be used in plaster of Paris articles.
2411. W. Hall and A. Wells. Telegraph cables.
2416. W. E. Newton. Attaching wheels to axles. A communication.
2424. J. Drummond. Reaping and mowing.
2431. H. H. and W. F. Henson. Starch.

The full Titles of the Patents in the above List can be ascertained by referring back to their numbers in the Lists of Provisional Protections previously published.

Opposition can be entered to the granting of a Patent to any of the parties in the above List who have given notice of their intention to proceed, within twenty-one days from the date of the Gazette in which the notice appears, by leaving at the Commissioners' office particulars in writing of the objection to the application.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

2519. C. Whipple.
2534. H. Wickens.
2535. W. Crosley.
2540. G. Cooke.
2553. J. Wilkinson, sen., and J. Wilkinson, jun.
2581. G. T. Bousfield.
2646. J. Jobson.
2653. C. Sanderson.

LIST OF SEALED PATENTS.

Sealed November 16th, 1858.

682. M. Duce.
1092. J. H. Johnson.
1094. J. and W. Allen.
1097. W. H. Bagnall.

1098. W. Raymond.
1099. C. W. Harrison.
1103. R. Imeary and T. Richardson.
1108. E. C. Brochand.
1111. J. Brown.
1113. W. MacNaught and W. R. Critchley.
1120. W. Clark.
1135. J. Apperly and W. Clissold.
1141. J. Ronald.
1147. J. H. Johnson.
1157. M. Stevens.
1176. J. Luis.
1209. E., R., and P. Sykes.
1228. A. Barchou.
1244. J. Meiklejon.
1286. R. Wappenstein.
1294. J. Rawlings.
1298. D. Moseley.
1310. C. Cammell.
1311. J. Roberts.
1339. A. V. Newton.
1352. F. J. Wedel-Jarlsberg.
1414. S. Barlow.
1523. J. Holland and F. Potts.
1677. J. J. Cooke.
1706. J. Miles.
1903. M. Benson.
1944. F. J. Evans.
1989. W. E. Newton.
2101. E. Welch and J. Biggs.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions.

NOTICE TO CORRESPONDENTS.

Articles and Correspondence designed for insertion in the ensuing Numbers of the *Mechanics' Magazine* must reach the Office by the Tuesday of each week, at the latest. It is highly desirable that they should be forwarded earlier if possible.

CONTENTS OF THIS NUMBER.

LONDON: Printed and Published by Richard Archibald Brooman, of 166, Fleet-street in the City of London. Sold by A. and W. Galignani, Rue Vivienne, Paris; Hodges and Smith, Dublin; W. C. Campbell and Co., Hamburgh.

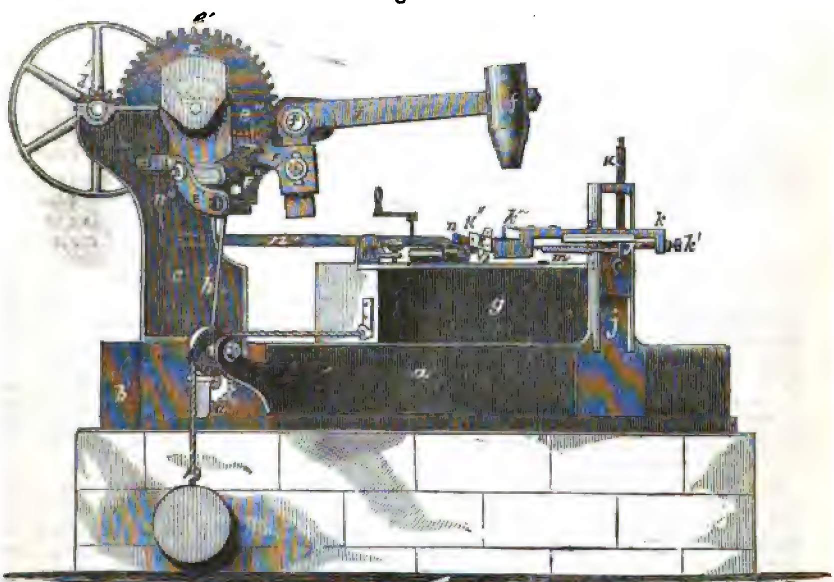
Mechanics' Magazine.

No. 1842.] SATURDAY, NOVEMBER 27, 1858. [PRICE 3D.

Edited by R. A. Brooman and E. J. Reed, 166, Fleet-street, London, E.C.

PRESTON AND McGREGOR'S PATENT MACHINERY FOR FORGING AND CUTTING FILES.

Fig. 1.



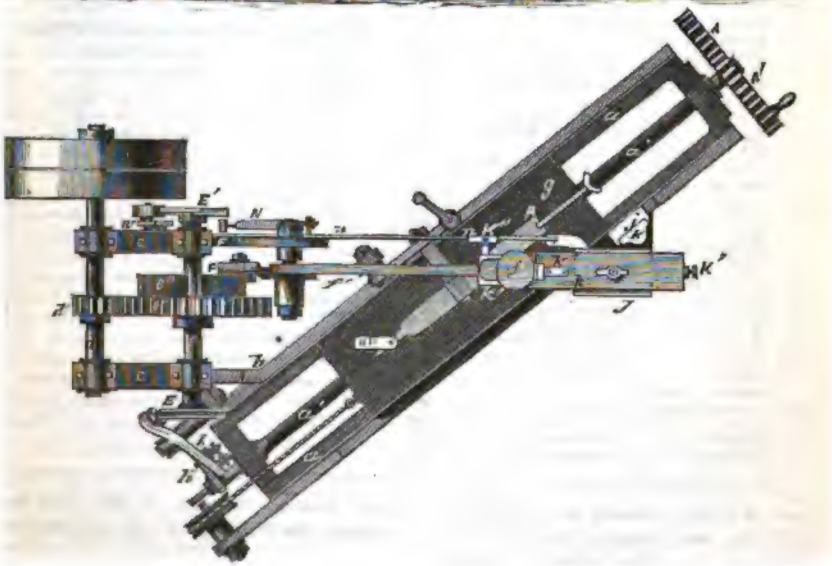


Fig. 2.

PRESTON AND McGREGOR'S PATENT MACHINERY FOR FORGING AND CUTTING FILES.

Mr. Francis Preston, mechanical engineer, and Mr. W. McGregor, mechanic, both of Manchester, have conjointly patented a set of improvements in machinery for forging files, which consist, first, in so constructing the anvil block and swages of the tilt hammers used in forging files, that the top swage is kept parallel with the bottom swage; secondly, in the application of conical cams or other equivalent combinations of machinery for altering the force of the blow given by the hammer or tilt head; and also a set of improvements in machinery for cutting files, which consist, first, in the application of a ball joint to the chisel holder; secondly, in an improved mode of applying a spring for holding the chisel holder, and for causing it to return to its place; thirdly, in the application of a compensating loose tail to the end of the hammer lever, to regulate the force of the blow of the hammer; fourthly, in recessing the bed or table to the correct shape of the file to be cut, and leaving one side of the recess open to facilitate the removal of the file; fifthly, in connecting the chisel holder to a spring instead of to a rigid arm or bracket, as heretofore; sixthly, in the application of a compensating guard for working the chisel on the second cut; and, lastly, in the application of a varying expanding cam, or other positive agent, to lift the hammer when cutting taper or other files that are not parallel or nearly parallel throughout their length, so as to give blows of different degrees of force corresponding to the breadth of the file.

In the specification of their patent they first describe and illustrate a tilt hammer to which their improvements are applied. The hammer head and spindle are raised by conical cams fixed on the shaft, which is turned round by a strap driven in the usual manner; to the anvil block are cast or fixed guides, and the bottom swage fits between the guides, and the top swage fits in the lower end of the spindle, which is also guided between the guides; by this means the top swage is kept parallel with the bottom swage. The conical cams can be set nearer together or further apart, so as to increase or reduce the lift of the hammer, and thereby to vary the force of the blow given by the hammer. Their improvements in tilt hammers are particularly useful in setting down the end of the file to form the shank.

Fig. 1 of the engravings on the preceding page is an elevation, and fig. 2 a plan, of a machine for cutting files, to which parts of their improvements are applied; *a* is a cast-iron bed, to which is cast or bolted the projection, *b*, supporting the standards, *c*, *c*. The shafts, *d* and *e*, revolve in bearings in the standards, *c*, *c*, the former being provided with a fast and loose pulley, and with a pinion, *d'*, gearing into the wheel, *e'*, fixed on the shaft, *e*; to the face of the wheel, *e'*, are fixed the two cams, *e''*, for raising the hammer, *f*, as will be explained hereafter. The table, *g*, moves on the bed, *a*, the requisite motion being imparted to the table by the screw, *a'*, which passes through a nut fixed to the table. The screw, *a'*, works in bearings in the ends of the bed, *a*; at one end of the screw is fixed a ratchet wheel, *a''*, which is moved a tooth at every half revolution of the shaft, *e*, by the double cam, E, acting on the lever, E', which is connected to the click lever, *h*, by the link, *h'*; the click, *h''*, jointed to the lever, *h*, takes into the ratchet wheel, *a''*, and gives the requisite motion to the table during the cutting of a file; the pinion, A, at the other end of the screw, *a'*, is driven by the wheel, A', and is used for moving the table back to the starting point; the parts above referred to are made in the usual manner. To the bed, *a*, is fixed an upright, *j*, supporting the bracket, *j'*, to which is bolted the slide, *k*, of the chisel holder, *k'*; the end of the shank of the chisel holder is hemispherical, and a corresponding recess is made in the slide, *k*, by which arrangement the chisel adapts itself to the face of the file to be cut; the chisel holder is acted upon by the spring, *k''*, fixed to the slide, *k*; the chisel or cutting tool, *l*, is connected to the chisel holder by a pin; to the end of the shank of the chisel holder is connected one end of the spring, *m*, the other end being secured to a stud projecting from the slide, *k*; this spring, *m*, holds the chisel holder in its place, and causes it to return to its place after it has been raised by the incline, *n*, and after the chisel has been struck by the hammer.

When it is necessary to regulate the angle of the chisel, the level of the chisel holder can be varied by the compensating screw, K, and the lateral position of the chisel is regulated by the compensating screw, K', which passes through the end of the slide, *k*, and acts against the bracket, J'.

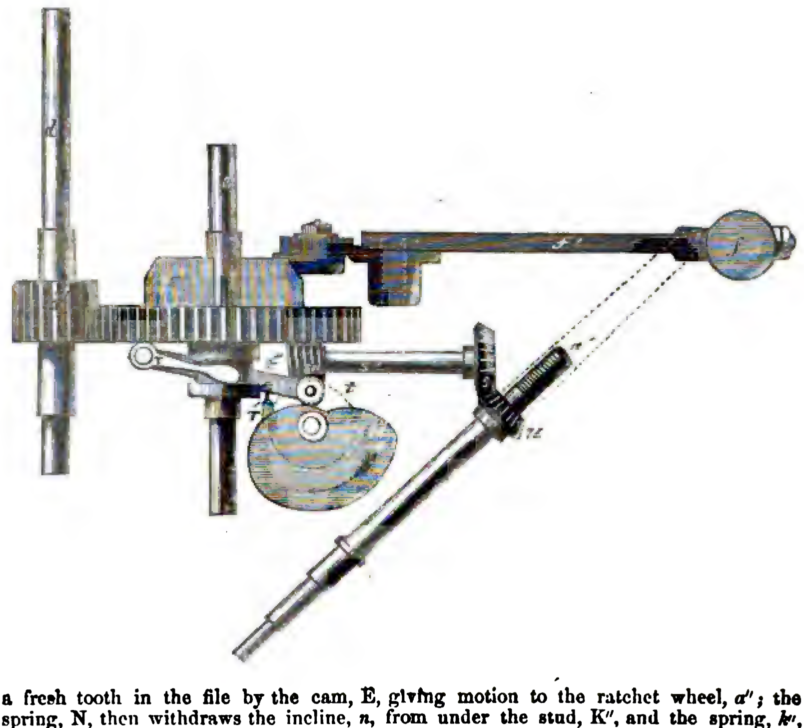
The chisel is lifted off the face of the file after every cut by the incline, *n*, fixed to the bar, *n'*; this incline is pushed under the stud, K'', by the eccentric, E'', which acts on the lever, *n''*, to the lower end of which the bar, *n'*, is jointed, or the chisel can be lifted in any other convenient manner. The hammer, *f*, is fixed to the horizontal arm of the elbow lever, *f'*, whose fulcrum is the stud, *f''*; to the vertical arm of the lever, *f''*, is fixed the adjustable piece, F, to which is secured the compensating loose tail, F'; the wheel, *e'*, in revolving causes the cams, *e''*, to act on the tail piece, F', in order to elevate

the hammer, *f*, which descends by its own gravity, and, falling on the end of the chisel, imparts to it a blow of the requisite force for cutting a tooth in the file; the force of the blow depends on the weight of the hammer and the height to which it is raised, and this can be regulated by moving the piece, F, nearer to or further from the stud, *f''*, and by moving the tail piece, F', nearer to or further from the centre of the shaft, *e*; the stud, *f''*, is also adjustable in a slot of the bracket, F'', in which it is fixed; this bracket is capable of being moved up and down on the standard, *c*. By these means hammers of different sizes may be used, and the face of the hammer can be set so as to strike the centre of the chisel, notwithstanding the reduction in its length caused by wearing and grinding.

The table, *g*, which they prefer to make of solid wrought iron, is recessed to suit the curve or form of the file to be cut, and one side of the recess is left open to facilitate the removal of the file. By thus making the recess to the correct shape of the file, it is only requisite to place a piece of strong paper or a thin sheet of lead or other suitable material between the file and the table, merely to protect the teeth on the under side of the file, thereby obtaining the requisite solidity to resist the blow of the hammer on the chisel.

When the machine is set to work, the end of the file marked A is brought under the chisel, and as soon as the hammer has struck the chisel it is raised off the file by the incline, *n*, as above described, the ball socket of the chisel holder, *k'*, allowing it to swivel in the slide, *k*; the table, *g*, is then moved the requisite distance for cutting

Fig. 3.



a fresh tooth in the file by the cam, E, giving motion to the ratchet wheel, *a''*; the spring, N, then withdraws the incline, *n*, from under the stud, K'', and the spring, *k''*, acting in the chisel holder, *k'*, brings the chisel again on to the face of the file, ready to receive the next blow of the hammer, *f*; these operations are repeated until the whole surface of the file has been cut, when by means of a self-acting stop motion the driving strap is thrown from the fast to the loose pulley, thereby stopping the machine. The attendant then turns round the wheel, N, to bring the table, *g*, back to its original position, and, after reversing the position of the file or replacing it with another file blank, again sets the machine in operation.

The patentees also describe a tool holder, furnished with a shank which swivels in a bush attached to a spring which is fixed in a bracket. The spring is set so as to press the chisel on to the file, and the chisel is lifted off the face of the file when a tooth has been cut, by an incline acting on a stud, as before described. The chisel holder is furnished with a compensating guard, which is held at all times in contact with the face of the file.

Fig. 3 (page 507) represents a plan of part of a file-cutting machine, illustrating the last of their improvements. *a'* is the screw in the bed; to this screw is fixed a bevel wheel, *u*, gearing into the wheel, *s*, fixed to the shaft, *s'*, at the other end of which is the worm, *s''*, gearing into a worm wheel, *t*, to which is fixed the eccentric, *t'*, which acts on the lever, *t''*, fixed to an upright shaft furnished above with a forked lever, *t'''*, taking into a groove in the boss of the wheel, *e'*; to this wheel are fixed the varying expanding cams, E, which act on the tail piece, F'; the end of the lever, *t''*, is held up to the eccentric, *t'*, by a spring, T'. The eccentric, *t'*, must be shaped according to the file that is to be cut, and the wheels and worm by which it is driven must be so calculated that it shall perform nearly one revolution during one traverse of the table, *g*; in the present instance we have shown a cam suitable for cutting a file that is parallel for a part of its length, and then taper towards the point, as shown in dotted lines. In commencing operations the smaller ends of the cams, E, act on the tail piece, F', and raise the hammer, *f*, sufficiently to give the requisite blow for cutting the point of the file, and as the eccentric, *t'*, gradually turns in the direction of the arrow, it causes the wheel, *e'*, and cams, E, to slide along the shaft, *e*, thus bringing the larger parts of the cams, E, into operation on the tail piece, F, and thereby increasing the lift of the hammer, and consequently increasing the strength of the blow on the chisel, in proportion to the increased surface of the file to be cut. When the taper portion of the file has been cut, the concentric portion of the eccentric, *t'*, comes in contact with the end of the lever, *t''*, and the largest diameters of the cams, E, act on the tail piece, F', and the lateral motion of the wheel, *e'*, is stopped until the parallel portion of the file is completed.

PROFESSOR HUGHES'S PRINTING TELEGRAPH.

We have received the following letter from Mr. S. E. Phillips:—

To the Editors of the Mechanics' Magazine.

Gentlemen,—The reference to the Hughes Printer in your pages of this week calls for some remark. The Atlantic Telegraph Company have not been slow to give that invention every facility. Quite the reverse; it has received great encouragement at their hands; and the late manager of the company, who is pecuniarily interested in the patent, has done his utmost to encourage the introduction; and, amid a host of pompous announcements in the American papers, it was given out that the embarrassment in working the Atlantic line was owing to the Whitehouse instruments working imperfectly; and that when Mr. Hughes and his instruments were ready all would go right; and that it was arranged for him to take possession of the electrical department, &c., &c.

But what are the facts?

1st.—The proprietors of the Hughes Printer want to negociate an arrangement beforehand binding the company to a large bonus and yearly royalty for a rate of working less than half that already achieved by the Whitehouse instruments, and yet the semi-official article in the *Times* speaks of the liberal offer of Mr. Hughes!!!

2nd.—It is a great mistake to suppose the Hughes Printer would be less liable to derangement from earth currents; the fact is diametrically the opposite. The Whitehouse-Morse system worked admirably and rapidly despite these currents, even though they were greatly aggravated by such an imperfect state of the wire.

Let it then suffice to place these opposite opinions together until Mr. Hughes can have a much fairer opportunity to try his skill than that which now subsists.

3rd.—It is false and delusive in the highest degree to represent the Hughes system as four times faster than the Morse. Taking the supposition, as alleged, of four currents, impulses, or units of time, as the average worth of a Morse letter, it is thence urged that the printed letter of Hughes takes only one such current or unit.

This Printer is a *time* instrument (the varied intervals of time allowed between current and current determine what letter in the type wheel shall present itself to be printed) and will probably be found for long submarine lines a *slow* instrument; because after the time of one unit has elapsed there must then occur a length or space of time divisible into the twenty-six letters of the alphabet, and sanguine indeed must that mind be to imagine that these twenty-six intervals could be discriminated at 2,000 miles distance in less than three such units of time.

For my part, I do not believe Mr. Hughes will accomplish it in less than double that time.

Of course, I do not overlook the fact that by skilful mechanical and electrical contrivances which have yet to be worked out, this space of time may be considerably reduced to a lower mean.

The instrument, as hitherto tried on comparatively short lengths, has realized a letter for about every fifteen such intervals.

The first consideration should be to prove *to others* that said Printer will work at all through the entire length; and even then Mr. Hughes will probably have hard work to approximate to the speed of the Whitehouse-Morse system.

I remain yours truly,

Samuel E. Phillips,

Late Electrician's Assistant to the Atlantic Telegraph Company.

We happen to be in a position to offer a few remarks upon the subject of the above letter, in which we shall show that the Atlantic Company have yet a great duty to perform in accepting the terms proposed by Professor Hughes. The Atlantic cable

is at present lying waste, and any electrician, whoever he may be, has a just right to expect a very liberal remuneration for rendering it available to the company and to the public. The very first proposal of Professor Hughes, which is to enter upon the necessary experiments upon the cable with his own instruments at his own expense, is, we submit, a most liberal offer. Mr. Phillips's second point is not better substantiated than his first. Against his assertion we oppose ours, and say that the Hughes printing apparatus is much less liable than the "Whitehouse-Morse system" to derangement from earth currents, for the compactness with which a message is recorded by the former is much greater than with the latter. The question of rapidity of communication—Mr. Phillips's third point—is not a very important one in the present state of affairs, but we think Mr. Phillips must have failed to comprehend the capabilities of the Hughes instrument in that respect. As to the last paragraph of the above letter, we do not see how Professor Hughes can do more towards proving his assertion "to others" than he has already done in making the offers he has made.

On Tuesday last we visited Mr. Henley's works at East Greenwich, and saw Professor Hughes's instruments in operation, and the result of our investigations is that there is even better cause than the *Times* announced for believing that the Atlantic cable may yet be rendered the channel for perfect communication between England and America in both directions. What the *Times* stated respecting the earth currents is founded on fact, and we have no doubt whatever that the Hughes instrument, as modified to suit the circumstances of the Atlantic cable, is thoroughly well adapted to the transmission and receipt of signals by means of the faint currents now sent through that cable. But, in addition to the advantages of the printing apparatus, Professor Hughes has an invention by which the faintest conceivable currents may be utilized. To assure us of this, a battery was formed on Tuesday of two fragments of wire, excited to an extremely low degree only. The current from this battery was, of course, so faint as to be entirely incapable of producing anything like a deflection in the needle of a fine Henley galvanometer, even when the instrument was placed in the circuit close to the battery. Yet this extremely faint current, when passed through 240 miles of the Australian cable, now shipping from Mr. Henley's works, worked the printing apparatus perfectly—so well is that apparatus qualified to receive the influence of the most diminished electric current. The conclusion is, that not only are the currents obtained at Valentia from Newfoundland sufficient to record signals, but that the Hughes apparatus may be worked, and signals recorded perfectly, even long after all currents perceptible by the ordinary instruments have ceased to exist. Need we add one word to induce the Atlantic Company to close at once with Professor Hughes?

THE RAILWAY SYSTEM IN IRELAND.

The paper read at the Institution of Civil Engineers, Nov. 16, 1858, was, "On the Railway System in Ireland, the Government Aid afforded, and the Nature and Results of County Guarantees," by Mr. G. W. Hemans, M. Inst. C.E.

This communication was suggested by the address of Mr. Locke, M.P., President, in January last, which related chiefly to French railways. From that address it appeared that, in 1854, the French railway shareholder received, on an average, 9 per cent.; while, on the other hand, in 1857, the English railway shareholder only obtained 3·12 per cent., or less than what was derived from money invested in the Public Funds. In the one case, assistance and protection had been afforded by the Government; but, in the latter, as was well known, speculation had been allowed to take its freest development. The result was, that at the end of 1856, in England and Wales alone, with an area of 58,000 square miles, there were 6,441 miles of railway opened; but in France, with an area of 204,000 square miles, there were only 4,060 miles of railway opened; so that England and Wales were relatively 500 per cent. better furnished with railways than France, and at the same time the accommodation on the individual lines was superior. It might be assumed, however, that, although the shareholders lost by competing lines and duplicate stations, the country gained; for in no case had any line been actually closed for want of traffic, or because it was valueless.

Ireland, in 1836, was a blank, as far as regarded railways, as it possessed at that time only the line from Dublin to Kingstown, about six miles in length. An extract was then given from an official document, to show the then depressed condition of the country, which resulted in the appointment, in 1836, of a Government Commission, consisting of Sir John Burgoyne, Mr. Barlow, and Mr. (now Sir) Richard Griffith, "to inquire into the manner in which railway communications could be most advantageously promoted in Ireland." During the labours of this Commission, many Joint Stock Companies were held in abey-

ance. The report was finally made in July, 1838, its main recommendations being considered sound and good. It advised the construction of great leading communications, each in possession of an important district, and strongly insisted on the vital importance of protecting them from the ruinous rivalry of competing lines. The lines actually made, however, especially in the northern part of the country, were widely different from those suggested by the Commissioners, and the railway interest had suffered accordingly. There were already two trunk lines to the north, instead of one, and a third line was in contemplation. Two main lines also existed to the west, and three to the south, from Dublin. It was imagined by the Commissioners that the lines might be made for £11,000 per mile on an average; that the receipts would amount to seventeen pounds fifteen shillings per mile per week, on the supposition that the exports amounted to 700,000 tons; that the cost of locomotive power would be two shillings and threepence per mile, at a speed of 30 miles an hour; that the utmost profits would not exceed 3½ to 4 per cent.; that the western line could not be attempted without ruin to the shareholders,—it had since been made, and was paying a dividend of 5 per cent.; and that the line from Newry to Dundalk was physically impossible. Although these mistakes had been made, arising from want of experience, the final recommendations of the Commission were excellent. A uniform gauge was insisted on, although the exact dimensions recommended by them were not ultimately adopted; and Government was advised to advance two-thirds, or even the whole of the capital for the construction of the leading lines, the principal and interest of such advances to be secured on local or baronial rates, in such districts as should consent so to obtain the benefit of railways. This principle had already been adopted in Ireland, for the Shannon navigation. The report was laid before Government, but, as no steps were taken to carry out its recommendations, great discouragement was given to the financial success of such undertakings by private companies. In this way speculation languished for nearly six years, only two lines—the Ulster and the Dublin and Drogheda—being slowly made. When, however, the railway mania attained its height in England, it extended to Ireland, and then the country began to make for itself, and with little regard for anything like a national system, the various lines now in existence, almost all of which were originated in 1845 and 1846. But the panic arose, and subsequently the famine of 1847, which stopped enterprise for a time; and although, as an alleviating measure, the Government were strongly urged to assist Irish railways, at which period only 123 miles had been opened, the Acts having been passed for 1,500 miles, yet the proposition was rejected, and, instead, the people were fed without giving any labour in return, or were employed in the mockery of useless road-making. About eight millions sterling were so expended, none of which, although originally intended as a loan, had, the author believed, ever been returned to the Imperial Treasury. Subsequently aid was given to the railways to a considerable extent, in another form. More than two millions sterling were lent to Irish companies who had obtained Acts of Parliament, through the agency of the Public Works Loan Commission; and although the rate of interest, in most cases 5 per cent., was, in the author's opinion, too high, the railway system had been materially assisted and promoted, and not one bad debt had been incurred. Only one line had been executed on the principle recommended by the Commissioners in 1838—that of charging a low rate of interest, secured on the guarantee of a local rate, in aid of the profits of the line, with an additional rate commencing ten years after the opening of the line, and payable by the Company as a sinking fund, to replace the whole amount of the loan. This exception was in favour of the Midland Great Western of Ireland, to whom a loan of five hundred thousand pounds had been granted to construct the line between Athlone and Galway. The interest was at the rate of 3½ per cent., and the sinking-fund rate 1½ per cent. additional. In this case the representatives of the counties of Roscommon and Galway voluntarily consented to a compulsory rate, guaranteeing to make up the difference between the profits of the line and the interest, provided the Company were compelled to construct it with the borrowed money, and to pay out of their own funds the additional 1½ per cent. as a sinking fund. The time in which the whole sum would be repaid was about thirty-five years. The author, having previously constructed the line from Dublin to Mullingar, was appointed to execute the extension to Athlone and Galway, the whole length of which, 76½ miles in extent, was opened simultaneously in August, 1851, within twenty-two months from the commencement of the works. In the first half-year the deficiency of profit was only 1·4 per cent., and afterwards 1·6 per cent., instead of the whole 3½ per cent.; and in every succeeding half-year the profits had increased, until they are now fully equal to the interest payable to Government. The total sums paid by compulsory rates on the county of Galway, and the

two baronies of Roscommon, had amounted to £37,414. The author thought it would be conceded that the guarantee system had in this instance proved highly beneficial; and as a further proof that this was felt to be the case he mentioned, that since the completion of the Galway line many attempts had been made to obtain similar guarantees for other lines, but when the bills came before Parliament, the most determined official opposition was given to the guarantee clauses, so that only three had passed—the Killarney Junction, the Bandon and Bantry, and the Bagnalstown and Wexford,—and in these the clauses were so hampered with impossible and useless conditions, and so emasculated, that they were found to be totally inoperative. Hence the original recommendation of the Railway Commission, that lines should be guaranteed by local rates, which had been successful in the only case attempted, had not been acted upon. The system had been found to work well in France and other continental states, as India and other colonies; and was frequently compelled to be adopted in the case of gas, water, roads, drainage, &c., yet it was held to be inapplicable to railways.

At the end of 1856, there had been constructed in Ireland 1,056 miles of railway, rather more than one-half of which were single line, though the works were for double way. The cost had amounted to fourteen millions, the average per mile having been less than fifteen thousand pounds, but lately this had been reduced to from six to seven thousand pounds per mile. The average receipts were twenty-one pounds per mile per week, the dividend amounted to 4½ per cent. nearly, and the working expenses to 39 per cent. In England these figures were, receipts sixty pounds per mile per week, dividend 3·56, and working expenses 49 per cent., respectively; the cost per mile having reached forty thousand pounds. The favourable result here indicated was attributed to economy in construction and in working.

The discussion, which was commenced, was announced to be continued at the next meeting, when, if time permitted, the following paper would be read at the meeting of Tuesday, the 23rd inst.:—"On the Successful Operation by Locomotive Power, over Gradients of 1 in 17, and Curves of 300 feet radius, on inclines in America," by Mr. T. S. Isaac.

Recent Practice in the Locomotive Engine: comprising the latest English Improvements, and a Treatise on the Locomotive Engines of the United States. Illustrated by a series of Plates, and numerous Engravings on Wood. By DANIEL KINNEAR CLARK, C.E., London, and ZERAH COLBURN, C.E. Blackie and Son. Parts 1 and 2.

MR. D. K. CLARK having written an invaluable work on "Railway Machinery" a few years since, and Mr. Z. Colburn having lately written a good book on "European Railways," these two gentlemen have thought it would be well to combine their labours in the production of a further volume, which should form a supplement to "Railway Machinery," carrying forward the illustration of the practice of English locomotive engineers to the present day, and presenting the most recent attainments of American practice. The object is a very proper one, the writers are as capable of effecting it as any two men known to us, and the parts of the new work before us afford ample evidence of the zeal with which they have entered upon their task.

The first part opens with a chapter on the tensile strength of boiler plates—a subject which has become of great importance since we have taken to the carrying up of our working pressures to 150 lbs. per sq. in. in locomotives. This is followed by others on the tensile strength of riveted and welded joints of boiler plates, in which very interesting information is afforded. The authors speak very strongly, and very properly, in favour of Mr. Bertram's system of welded joints,* and express their conviction that riveted joints are destined to be superseded by welded joints. "Independently of the greater strength obtained," say they, "the reduction of weight and the permanent freedom from leakage are most important considerations as respects its application to vessels subject to steam or water pressure." We are able to state that a patent for constructing the beams, &c., of iron ships by the welding process has been taken out by Mr. Warder, a draughtsman in the Surveyor of the Navy's Office, who has had experience in the construction of iron vessels. Mr. Warder's invention is now being experimented upon by the Butterley Company, and will, we doubt not, prove very valuable. Another improvement which, like Mr. Warder's, appeared too recently to find mention in this work, is being worked with great ad-

* We grieve to have to state that Mr. Bertram, though alive, is the subject of so terrible an affliction that there is no hope of the increasing success of his invention ever becoming known to him.—EDS. M.M.

vantage by the Lowmoor Company. We refer to Messrs. Alton and Fernie's admirably simple, but most valuable, method of thickening the sides of plates, and bending the thickened parts to form the angles of boilers and other vessels, the ordinary plates being riveted directly to the turned-down portion of the thickened plate, without the use of angle iron. The full value of this invention it would not be easy to state. In addition to its direct advantages, it has the further one, doubtless, of getting rid of that unexplained, but very common cause of failure of boiler plates, not at the joints, but in their neighbourhood—a subject on which Messrs. Clark and Colburn write sensibly.

The remainder of the chapters in the parts before us are on the strength of stayed surfaces, tie-rods, screwed bolts, and roof-stays, and on the details of boiler construction. These parts likewise contain four splendid plates of locomotive engines by Mr. I. K. Brunel—Beyer, Peacock, and Co.—R. Stephenson and Co.—and Mason and Co., of Taunton, Massachusetts.

The following chapter of "Summary Conclusions on the Strength of Boiler-plate Joints," will serve both as an illustration of the authors' work, and as a valuable contribution in itself on a highly important subject:—

"In concluding upon the relative strengths of different forms of joints, we are disposed to base our conclusions upon the results of Mr. Brunel's trials, and of the trials at Woolwich, detailed in previous chapters; and, whereas it has been assumed that, in riveted boilers, the thicker plate is also the stronger because it is the thicker, it appears that ⅜-inch riveted plates are practically as strong as $\frac{7}{16}$-inch or ½-inch riveted plates. There is, therefore, no advantage in the selection of plates, as usually riveted, of greater thickness than ⅜-inch for boilers. The relative strengths of different forms of ⅜-inch rivet-joints have been found to be thus:—Single-riveted lap-joints, 60 per cent. of the strength of the entire plate; double-riveted lap-joints. 72 per cent.; double-riveted single-welt join, 65 per cent. The double-riveted double-welted joints of ½-inch plates, tested by Mr. Brunel, had 80 per cent. of the entire strength; and ⅜-inch plates so jointed would doubtless be found to have an equally large percentage of strength. The strain, indeed, is applied in the centre line of the plates without leverage, and the joint should have the same percentage of strength for any thickness of plate. The double-welt thus makes the strongest of all the rivet-joints; and for Yorkshire plates, having 25 tons per inch ultimate tensile strength, it would have a resistance equal to 20 tons per square inch of the entire plate. The ultimate strength of double-riveted single-welt joints, is 16¼ tons per inch; of double-riveted lap-joints, 18 tons per inch; and of single-riveted lap-joints, 15 tons per square inch of section, for Yorkshire plates.

"For plates of best 'Staffordshire' quality, having 20 tons per square inch absolute tensile strength, the ultimate strength with the double-riveted double-welt joint is 16 tons per square inch; with double-riveted single-welt joints, it is 13 tons per inch; with double-riveted lap-joints, it is 14½ tons per inch; and with single-riveted lap-joints, it is 12 tons per inch.

"Of the welded joints, the scarf-weld retains the whole strength of the entire plate, 100 per cent.; and the lap-weld retains 66 per cent.,—which, for Yorkshire plate, would amount to 16½ tons, and for Staffordshire plate 13 tons per square inch of section.

"There is, however, a most important and peculiar element of strength in the ordinary lap-joints for circular seams, as distinguished from straight seams, in the circumstance that the circular lap-joint cannot possibly be distorted like the straight lap-joint, under extreme tension; for, in virtue of the circularity of the joint, the outer plate must be extended at the edge, and the inner plate must be compressed, in order to change the form, becoming, in fact, a conical joint, in place of a cylindrical joint. The resistance to such an alteration of form in the circular joint is so great that it cannot practically alter its form at all; and there is no doubt that, as the influence of lateral leverage is here neutralized, the absolute strengths of all the varieties of lap-joint applied circularly increase with the thickness of the plates; but, on this particular question, there is a want of direct experimental evidence.

"For the maximum working strength of the material of a boiler and the joints, the proportion of one-fifth of the ultimate tensile strength may safely be adopted. In selecting this proportion, we are fortified by the practice of wrought-iron bridge engineers, who adjust the dimensions of the lower members of such bridges to a working tensile strain of 4 to 5 tons per square inch; the metal so employed being of Staffordshire manufacture, supposed to have an ultimate tensile strength of 20 tons per inch, and, of course, something less than that at joints.*

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* Mr. Fairbairn adopts only one-sixth of the ultimate tensile strength of the joint, for the maximum working pressure, in stationary cylin-

"The ultimate and working tensile strengths of plates, variously jointed, are placed together, for reference, in the following Table. The working strength is estimated, in all cases, at one-fifth of the ultimate strength.

" *Table of the Ultimate and Working Tensile Strengths of Boiler-plates and Joints, Deduced from Experiments with ⅜-inch Plates.*

Quality of Plate, and Nature of Joint.	Percentage of Tensile Strength, that of the entire Plate being = 100.	Tensile Strength. Ultimate Strength per square inch of the entire section of plate.		Working Strength per square inch of the entire section of Plate taken at one-fifth of the ultimate strength.	
Best Lowmoor Plate.	Per Cent.	Tons per Sq. Inch.	Lbs. per Sq. Inch.	Tons per Sq. Inch.	Lbs. per Sq. Inch.
1. Entire plate	100	20	56,000	5	11,200
2. Scarf-welded joint . . .	100	25	56,000	5	11,200
3. Lap-welded joint. . . .	66	16·5	36,960	3·3	7,392
4. Double-riveted double-welt joint .	80	20	44,800	4	8,960
5. Double-riveted single-welt joint .	65	16·25	36,400	3·25	7,280
6. Double-riveted lap-joint .	72	18	40,320	3·6	8,064
7. Single-riveted lap-joint .	60	15	33,600	3	6,120
Best Staffordshire Plate.					
1. Entire plate	100	20	44,800	4	8,960
2. Scarf-welded joint . . .	100	20	44,800	4	8,960
3. Lap-welded joint	66	13	29,120	2·	5,824
4. Double-riveted double-welt joint .	80	16	35,840	3·2	7,168
5. Double-riveted single-welt joint .	65	13	29,120	2·6	5,824
6. Double-riveted lap-joint. . .	72	14·5	32,480	2·9	6,496
7. Single-riveted lap-joint .	60	12	26,880	2·4	5,376

"Note.—1. For the strengths of the joints of American best plates, allow one-half more than for best Staffordshire plates; for ordinary American plate, one-third more; and for cast-steel plate, double.

"2. The contents of the table are correct for ⅜-inch plates, and for thinner plates; but they are altogether too high for thicker plates.

"In the order of strength, the joints range thus:—

1. Scarf-welded joint, ...	100	
2. Double-riveted double-welt joint,	80	per cent.
3. Double-riveted lap-joint, . .	72	,,
4. Lap-welded joint, . . .	66	,,
5. Double-riveted single-welt joint, .	65	,,
6. Single-riveted lap-joint, . .	60	,,

"These percentages are to be accepted as for plates not more than ⅜-inch thick, with straight joints. But, with circular joints they, no doubt, hold good for all thicknesses; excepting that the welded lap-joint would bear a much higher ratio, and rank next to the welded scarf-joint.

"In round numbers the working strengths of best boiler-plates are thus:—

Yorkshire plates, per square inch of entire section,	.	11,000 lbs.
Staffordshire plates, do. . .	.	9,000 ,,
American plates, do. . .	.	14,000 ,,
Do. (ordinary), do. . .	.	12,000 ,,
Cast-steel plates, do. . .	.	18,000 ,,

"In round numbers, the working strengths of joints are thus:—

	Best Yorkshire.	Best Staffordshire.
1. Scarf-welded joint, per square inch of entire section, ...	11,000 lbs.	9,000 lbs.
2. Double-riveted double-welt joint, ...	9,000 ,,	7,000 ,,
3. Double - riveted lap-joint, ...	8,000 ,,	6,500 ,,
4. Lap-welded joint, .	7,400 ,,	6,000 ,,
5. Double-riveted single-welt joint, . . .	7,300 ,,	6,000 ,,
6. Single - riveted lap-joint, ...	6,700 ,,	5,400 ,,

"It has been remarked, in a previous chapter, that the inferior strength of the lap-welded joint, in the trials at Woolwich, probably arose from the shortness of the lap, about 1¼-inch, causing a very oblique strain upon the plate; and that, had the lap been extended to 2 or 3 inches, it would likely have ranged in strength next the scarf-weld. The strength assigned to the lap-weld must be accepted as provisional, and open to improvement."

drical boilers; which, we think, is judicious, for boilers set in bricks and mortar are not permanently reliable. Brick-set boilers are a remnant of ancient practice, and must be set aside to make for self-contained boilers of the locomotive stamp.

Traité d'Électricité. (*Treatise on Electricity.*) Par J. GAVARRET. Paris: librairie de Victor Massan, Place de l'Ecole de Médecine.

SINCE first the knowledge and adaptation of electricity became a profession, the necessity has been felt of a manual of the science sufficiently comprehensive and explicit to meet the requirements of those engaged in its application, especially in telegraphic communication. No such manual has yet been published in the English language; and the work of De la Rive, though written in a foreign tongue, has hitherto been almost the only standard work of practical information on the subject. The first volume of the treatise of M. Gavarret in some degree replaced the work of the former electrician. The second and complementary volume, which is now under our notice, completes a work which will be of immense benefit as a general compendium of electric science. In the 1,000 pages contained in the two volumes, the electrician and the student of electricity will find ample information respecting phenomena the investigation and application of which engage so much attention in the present day, and also a book of reference more perfect and more complete than any which has hitherto appeared.

The mathematical portion of the second volume includes an analysis or expansion of the formula of Oken distributed so as to bear upon the different phenomena without forming a distinct section. The laws of resistance to the electro-dynamic circuit are clearly expressed in Art. 1. These, with the effects of electric tension in subterranean and subaqueous circuits, are of great interest in their practical bearings. With regard to the latter point we will give the following translation:—

EFFECTS OF ELECTRIC TENSION IN THE VOLTAIC CIRCUIT.

"The electric tension of the various sections of a metallic circuit traversed by a voltaic current is the cause of interesting phenomena that may be studied on a large scale in the extended subterranean and submarine telegraphic lines. Already in 1850, M. Werner Siemens had observed that, 'the subterranean wire with its isolating covering represents an enormous Leyden jar, which becomes charged by the battery power.' But it is especially the researches of Mr. Faraday which have made evident the static effects determined by the voltaic current.

"A copper wire of 1·6 *millimetres* diameter was enveloped with a uniform covering of gutta percha 2·5 *millimetres* in thickness, and plunged in the water of a canal; the extremities being kept out of the water, and isolated. With this Mr. Faraday had an *isolated* pile of 360 elements zinc and copper, charged with acidulated water. One of the extremities of this pile was placed in communication with the earth, and the other with one of the ends of the subaqueous wire through the medium of a galvanometer. The instant electricity was allowed to flow into the wire, the needle of the galvanometer was strongly deflected; but in a few moments the deviation became diminished, and the needle remained stationary at 5°,—thus indicating a feeble current due to the loss of electricity by the isolated extremity of the subaqueous wire. The communication of the galvanometer with the wire was then broken, and the galvanometer itself was connected with the ground. The result was a strong deviation of the needle from its position of equilibrium, but in a direction contrary to the original deflection. The first deviation was due to a flow of electricity charging the subaqueous wire; while the second indicated the reverse current due to the *discharge* of the same wire.

"The wire being charged as above, and a galvanometer fixed to each of its extremities, its discharge, when the galvanometers are connected with the earth, is effected simultaneously by each end. Each galvanometer is traversed by a current passing from the wire to the earth; and the centre of the covered wire is the point of departure of two currents, each traversing one half of the wire in the direction of the extremities. These experiments were repeated by Mr. Faraday with a covered wire of 160 *kilometres* suspended in the air. In this instance the phenomena of tension were no longer evident, or at least were comparatively inappreciable beside the results obtained with subterranean or subaqueous wires.

"The explanation of these phenomena is sufficiently simple. When the wire covered with gutta percha is placed in water, the electricity thrown into it by the pile produces, in virtue of its tension, a *lateral induction* through the dielectric upon the conducting fluid surrounding it. The metal and water, separated by the isolating covering, act like the coatings of the Leyden phial, and become charged with opposite electricities. When a connexion is established between the two coatings by means of the earth, which is itself in communication with the water, a discharge takes place, as in any other instance, through this conductor. When the wire is placed underground the earth itself becomes the external coating, and the explanation remains the same. On the other hand, when the covered wire is suspended in the air, there

is no longer a conducting body in contact with the external surface of the dielectric. The electricity of the wire doubtless acts by lateral induction upon surrounding conductors; but, as these bodies are at a great distance, the inductive action is feeble, and the effect of accumulation of static electricity becomes inappreciable. A long wire, however, must become to some extent charged with static electricity in those portions which are suspended in close proximity to the earth or to the walls of buildings.

"These experiments were continued by Mr. Wheatstone, who operated with the cable which was to establish telegraphic communication between the port of Spezia and the island of Corsica. He had thus at his disposition a copper wire of 1,062 *kilometres;* and in this case the wire was surrounded by a helix composed of twelve stout iron wires, forming a metallic coating of 8·4 *millimetres* in thickness. This cable represented, therefore, a true Leyden jar, with two metallic coatings separated by an isolating body. Consequently, in order to reproduce the phenomena observed by Mr. Faraday, there was no need to place the apparatus in water. The cable when coiled in a perfectly dry well, and connected by one end with a pile of 144 elements conjoined to form 12 compound elements, produced all the effects of the accumulation of static electricity of which we have spoken."

The following, p. 407, on the causes of the retardation of the electric current, bears also upon the subject of subterranean and subaqueous circuits. It is evident that these observations tend to prove that one of the most important problems for the practical electrician consists in the employment in these circuits of electricity of low intensity:—

"The enormous difference which exists between the various determinations of the rate of transmission of electricity must not altogether be referred to the difficulties inseparable from what is always a very delicate operation, nor to sources of error from which, even under the most experienced observers, the different experimental processes may not have been entirely free. Upon long telegraphic lines the electric current is liable to causes of perturbation, which have been pointed out by M. Werner Siemens, and carefully studied by Mr. Faraday and Mr. Wheatstone. We have seen that, according to their experiments, the current circulating in a telegraphic wire exerts an inductive action upon surrounding conductors. It was natural to believe that this lateral induction would modify the course of the electricity, and cause a diminution of the rate of transmission proportionate to the amount of inductive action. This hypothesis has been confirmed by the comparative experiments of Mr. Faraday upon lines of equal length suspended in the air and placed underground.

"The telegraphic line from London to Manchester consists of four wires of 600 *kilometres* buried in the earth. The extremities of the first and second wires were brought into contact at the Manchester station; and the same was done with regard to the third and fourth wires. At the London station M. Faraday attached a galvanometer to the extremity of the first wire, united, by means of a second instrument, the second and the third wires, and attached a third galvanometer to the extremity of the fourth wire. One pole of a battery was then connected with the first galvanometer, and the other pole with the earth. The free end of the wire of the third galvanometer was also placed in communication with the earth. The circuit of the battery was thus formed by a subterraneous wire 2,400 *kilometres* in length, with three equi-distant galvanometers separated by intervals of 1,200 *kilometres* of wire.

"Immediately the circuit was established, the needle of the first galvanometer was deflected; that of the second was influenced only after an appreciable interval; and about *two seconds* elapsed before the third galvanometer was affected. When the circuit was broken, the needle of the first galvanometer fell immediately to *zero;* that of the second began to retrograde a short time afterwards; and that again of the third took a longer time before it began to move. When the wire of the first galvanometer was disconnected with the battery and placed in communication with the earth, the electricity with which the wire was charged flowed from it by each end, where the galvanometers indicated the passage of two currents in contrary directions."

These extracts will serve to indicate the manner in which the author discusses questions of importance. We commend the work to our readers.

SHIPS' PUMPS.—We have received a letter from Mr. Roberts, of the Millwall Cable Works, in reply to "J. S. H.'s" remarks on the improved pump, and will publish the same in our next Number.

LONDON SEWAGE: SHALL IT BE WASTED OR ECONOMISED?

Mr. Charles F. O. Glassford, F.C.S., late manager of Messrs. Pontifex and Wood's well-known and extensive Chemical Works, has put forth a pamphlet on the above important subject,* in which, after making copious references to facts and figures, he lays down the following propositions:—1. That there is extremely little prospect of utilizing the sewage as it is, from the very minute proportion of fertilizing matters it contains, or of realising any pecuniary advantage to the citizens from its application to land by irrigation. 2. That the excreta will continue to be practically lost, and be the constant source of great danger to human health and life, unless these matters can be otherwise intercepted, collected, and conveyed away. 3. That if the access of the excreta be carefully and completely excluded from the sewers, and the sewers kept for their legitimate and proper uses, they would no longer be a source of danger and annoyance, and the river would be freed from the pollution to which it is at present subjected. 4. That the exereta thus collected would then become a source of valuable home manure, and its manufacture and sale would realise a splendid annual revenue after paying all charges. He next proceeds to estimate the quantity of solid and liquid sewage which have to be dealt with in London, and then states the outline of a plan which he proposes for dealing with it. It consists, briefly, in the collection of the excreta with as small a quantity of water as possible,—instead of washing it into the sewers with a large and unknown quantity, and in collecting it in sunk vessels from which it is periodically, daily or oftener, withdrawn through iron pipes by means of pumping machinery, and discharged into reservoirs, each sufficient for at least the produce of twenty-four hours. It is here mixed with oil of vitriol sufficient to decompose the urea, and to form sulphate of ammonia, and allowed to settle. The clear liquid is pumped into boilers and evaporating vessels, and there concentrated until crystallization occurs, and the salts are separated from the water. The solid matter, which falls to the bottom of the reservoirs, is drawn through pipes from the bottom by pumps, and forced into a filtering apparatus, which expresses the liquid, and produces the solid matter in a state of almost dryness. These two products form manures which contain all the fertilizing properties of urine and fæces, and may be sold separately or together, mixed in the relative proportions yielded daily, in which condition it is a rich manure having in abundance all the mineral and organic constituents required by plants in their food. As it is of the first importance—for the economical success of the whole plan—to obtain the excreta with as small a quantity of water as possible, consistent with perfect cleanliness of the closet, it is necessary to provide:—First, a stop-cock or valve, which shall deliver when opened only a certain and determinate quantity of water, or, in other words, it must be self-closing and self-measuring. Second, that the delivery of this water should only occur after the closet has been used, and the contents of the pan discharged into the vessel underneath; the fresh water then entering sweeps the sides of the pan or basin, removes any adhering matter, and remains in the pan until again discharged with excreta as before. Third, a small cistern or vessel under the closet-pan, wherein the excreta may collect until two or more gallons are accumulated; this allows the solid matter to become softened and intermixed with the liquid (dissolved in it, to some extent), and will materially reduce the possibility of stoppage in the conveying pipes, with the additional advantage obtained from the rush of a considerable bulk or volume of liquid matter suddenly released into the pipes. For the first and principal purpose, he has obtained from the inventor, Mr. Morris, engineer of the East Kent Waterworks, a stop-cock or valve, which will accomplish the very important function of delivering any desired quantity of water, ounces or gallons, with equal certainty and precision; and he has himself designed a form of closet which unites all the requisites, and has submitted it to several well-known manufacturers in London, who consider it well adapted for the purpose, and capable of being made at a very moderate price. According to the statistics collected and tabulated by Mr. Lawes, the average weight of solid excrement voided per diem by each individual of the population amounts to 2¾ ounces, say 3 ounces in round numbers: now what quantity of water will be necessary to remove these 3 ounces from the pan? Four times this volume—viz., 12 ounces—will, Mr. Glassford thinks, be found amply sufficient for the purpose. If we suppose that the fæces of an adult will occasionally amount to 6 ounces, or more than double the ascertained average quantity, 12 ounces of water will yet be double the volume of the fæces, and still sufficient for the purpose. But the fæces when voided are generally if not always accompanied by urine, which will assist the carriage of the solid excrement, by increasing the volume of liquid matter. He, therefore, assumes that 12 ounces of water will be the maxi-

* Published by Effingham Wilson, Royal Exchange. 1858.

mum required. This amounts to almost exactly one-third of the volume of urine voided per individual, and will form one-fourth, or 25 per cent., of the total liquid to be evaporated and concentrated. He shows that a larger volume of water than this may be used in the closets,—if found necessary or advisable for sanitary purposes,—and yet obtain a satisfactory economical result. He pursues the consideration of other details at considerable length, and concludes by stating that the very small influence, comparatively, which a very large quantity of water has upon the pecuniary results, induces him to hint that we may have simply to apply the regulator-valve to the whole of the present water-closet arrangements of London, limit the amount of water to, say, one-fourth or one-third of a gallon per each discharge, and lay down the pipe and other cistern arrangements proposed in connection therewith. "In this way the citizens would individually be saved an enormous outlay, and the whole plan could be put very speedily in execution—within the next twelve months, as every part could be done simultaneously—and in process of realisation of revenue. The revenue would be such as to render it unnecessary to put the citizens to any expense whatever in making the new arrangements and alterations, and induce the hope that it would be sufficient to remove or alleviate many of the heavy burdens with which they are now taxed, besides presenting a large fund annually for carrying out the Metropolitan improvements so much wanted at this moment."

IMPROVED SAILING VESSELS.

(From a Correspondent.)

Mr. Bishop, of Kingston, near Portsmouth, is building a vessel of about 150 tons, which is creating much curiosity amongst the naval men at the port. She is constructed on the patented system of Mr. G. R. Tovell, and under the superintendence of a very intelligent person, Mr. Thomas Price. The two vessels which have been already built on this principle, —viz., the *Margaret* and *Laughing Water*, are stated to have been quite successful, and have attained almost marvellous rates of speed, so much so as really to suggest the probability that a new form in naval architecture has been discovered, which will supersede those hitherto in use. Mr. Bishop's new vessel has been visited by several naval officers of rank; amongst others, Admiral Sir George Sartorius has evinced considerable interest in her construction.

NOTES UPON IRON AND COAL.

The Iron Trade in the past Month—A slight Decline in Make—Prices firm—Board of Trade Returns for September—Board of Trade Returns for the nine Months—Singular Conclusions—The Coal Trade—How affected by the Strikes—Mr. Robert Hunt's Statistics—Decrease in the annual Get—Extensive Water Works in South Staffordshire—The Bessemer Process.

The past month has not seen so much movement in the iron trade as was the case in October. This is attributable, however, more to the fact of the period being a nearer approach to the end of the year, when it is desired by all purchasers that their stocks shall be as low as possible. Less Scotch pig iron has been made for exportation, and the great malleable iron makers of Yorkshire and Staffordshire have not received so many orders. Most of these are, however, tolerably well occupied in the production of iron of a good quality; whilst, in South Wales, there continues to be received a steady flow of orders for rails. The new districts are making headway, and none of them faster than North Staffordshire, which is successful against its older rival, South Staffordshire, in the low-priced iron for the Manchester market. Prices have remained tolerably steady for both pig and also manufactured iron, and are not likely to exhibit any variation at the end of the year.

The Board of Trade Returns for the month ending with September show that, as compared with the corresponding month last year, there was, in the case of pig iron, a diminished exportation to all countries; but in respect of bar and rod iron there was an increase in the shipments to France, while the exports to all other countries were much below those of the corresponding period of last year. The export trade in cast iron was remarkable for the large quantities sent to India and Australia, the value of the exports to the former country being £41,070 against £6,179; and of those of our southern colonies, £20,946 against £11,274. The exports of wrought iron to India rose from £25,211 to £34,083. The American trade improved in respect of pig iron, sheet copper, and lead; but other metallic exports to the United States compare unfavourably with those of last year.

The returns for the nine months ending with the same period furnish some interesting facts. Comparing the declared value in such case with the quantity exported, the returns give the following results:—

IRON.	Quantity.		Value.		Declared value per Ton.	
	1857.	1858.	1857.	1858.	1857.	1858.
	Tons.	Tons.	£	£	£ s. d.	£ s. d.
Pig	330,191	297,022	1,290,493	911,203	3 18 2	3 1 4
Bar, bolt, and rod	581,715	509,153	5,049,816	4,090,400	8 13 7	8 0 8
Wire	7,546	7,583	154,211	156,274	20 6 1	20 12 2
Castings	56,541	64,581	577,638	673,828	10 4 7	10 8 8
Wrought, all sorts	218,724	177,104	3,069,755	2,567,536	14 0 8	14 9 11
Steel	18,747	11,705	617,741	417,441	32 19 0	35 12 3
Hardware & Cutlery	29,138	24,298	3,049,662	2,372,418	104 13 3	97 12 9
Total . . .	1,242,512	1,091,446	13,809,316	11,189,140		

It will be seen that pig iron shows a large, and bar, bolt, and rod a considerable decline in the average price per ton; but the value per ton of other kinds of iron, and also of steel, actually appear to have been greater this year than last. This is rather a remarkable fact. There appear to be no good grounds for questioning the accuracy of the Returns as a basis for comparison, whilst, on the other hand, there can be no doubt that all kinds of iron have been considerably cheaper this year than last. Even in pig iron, which is exceptional on account of the extent to which speculation takes place in it, and from other causes, the reduction these Returns show in value is hardly equal to the difference in price in the general market, whilst in bars it is scarcely half as much as the actual reduction. By way of accounting for this seeming paradox, it may, in the first place, be stated that a great number both of purchasers of iron abroad, and sellers and producers at home, who last year were in an insolvent position and only living on from day to day, were prostrated by the crisis of last autumn. Such men, anxious only to do business so as to meet one set of liabilities by creating a larger, would naturally deal in inferior qualities; or, in the case of purchasers, accept very low prices. And it was to be expected that when this class was swept away, or at any rate their numbers greatly reduced, orders would be limited much more to superior qualities of iron or steel, as they would proceed from a more respectable class of consumers, and that, being executed by makers of a more solvent character, there would be less selling at a sacrifice to meet emergencies. There is also, no doubt, a growing tendency to set a higher value on superior quality in iron.

A pretty good index to the condition of the iron and hardware trades is the state of the coal trade. That in the past month has been no improvement upon the previous several months. More would, however, have been done but for the disaffection which seems to exist amongst the colliers in almost every part of the kingdom upon the question of wages. The South Staffordshire men, after their thirteen weeks' play, are grumbling and working at their masters' terms. The struggle has been most severe in Yorkshire. There, as fast as one pit's company resumes work, either at their own terms or their employers'—or, more frequently, on terms made to meet the requirements of each—other companies turn out, and large iron works have been standing in consequence.

Mr. Robert Hunt's very interesting annual volume of statistics on the metalliferous productions of the United Kingdom has appeared since our last. It appears that there is a decrease in the quantity of coal raised this as compared with last year, to the extent of 1,250,743 tons, the production of 1856 being 66,645,450 tons, and that of 1857 65,394,707 tons. The value is estimated at £16,348,676. The table in the following column, at the end of this article, is a summary, showing the number of collieries and the quantity of coal raised in each district.

A note-worthy event in connexion with the great iron-making district of South Staffordshire is the opening of a portion of the South Staffordshire Water Works, which, with its ultimate twenty-five miles of main, will supply the masses of that thickly populated district with an abundant supply of the element of which they have been deprived by the mining and manufacturing operations in which they take a part. The scheme was conceived and has been carried out by Mr. J. R. M'Lean, a man well known in the engineering and railway world. The capital of the company is £160,000, of which £130,000 has been expended, £20,000 going in the purchase

and erection of two magnificent engines by Messrs. James Watt & Co. The operations of the company hitherto have revealed a state of things unprecedented in its line. Out of 7,000 cast-iron main pipes supplied by Messrs. Cochrane & Co., of Dudley, *two* only yielded to the severe test to which they were put by the engineer before it was attempted to lay them down. The principal supporter of the scheme has been the Right Hon. Lord Ward. The water has been obtained from the immediate neighbourhood of Lichfield, whence into the Black Country the pipes are brought beneath the South Staffordshire Railway. So plentiful is the supply, that to the poor a barrel of water containing thirty-six gallons will be supplied for *a farthing!*

Mr. Bessemer's process does not seem to have become quite a dead letter. It is understood that the manufacture of iron and steel is being now successfully carried on in Sweden upon the system invented by Mr. Bessemer; and Messrs. Bessemer & Co. are engaged experimentally in Sheffield in the production of steel by their new process.

	No. of collieries	Tons of coal raised.
Durham & Northumberland	268	15,826,525
Cumberland	28	942,918
Yorkshire	374	8,875,440
Derbyshire and Nottinghamshire	194	3,687,443
Warwickshire	16	398,000
Leicestershire	14	698,750
Staffordshire and Worcestershire	563	7,164,625
Lancashire	359	8,565,500
Cheshire	31	750,500
Shropshire	55	750,000
Gloucestershire, Somersetshire, and Devonshire	99	1,225,000
North Wales	84	1,046,500
South Wales	325	7,132,304
Scotland	425	8,211,473
Ireland	70	120,630
	2,095	65,394,707

THE LATEST STEAM-SHIP NOVELTY.

The latest steam-ship novelty that has come to our notice is a steamer 180 feet long and 16 feet broad now building at Baltimore, United States, by Messrs. Winans, of that city. The number of the *Scientific American* for Nov. 6th enables us to place a sketch and the inventors' description of this curious vessel before our readers. She is in form very much like a cigar, is without masts, and is propelled by a large wheel encircling the entire vessel at midships. The inventors write of her as follows:—

"It has been with a view to obtaining greater safety, dispatch, uniformity, and certainty of action, as well as economy of transportation by sea (taking shipwrecks and other casualties and risks into consideration), that we have devised and combined the elements exhibited in the vessel in question.

"Experience has shown that steam power on board sea-going vessels, when used in aid of sails, insures, to a great extent, dispatch, certainty of action, and uniformity in the time of their voyages. Now, we believe that, by discarding sails entirely, and all their necessary appendages, and building the vessel of iron, having reference to the use of steam alone, the most desirable ends may be even still more fully obtained.

"The vessel we are now constructing has reference to these objects, and is for the purpose of experiment, to enable us to test the accuracy and practical value of our peculiar views. It has no keel, no cut-water, no blunt bow standing up above the water-line to receive blows from the heaving sea, no flat deck to hold, or bulwark to retain, the water that a rough sea may cast upon the vessel; neither masts, spars, nor rigging. The absence of sails not only renders the parts thus abandoned by us useless, but their abandonment in a vessel such as ours will, we believe, most materially promote safety, easy movement, or diminished strain of vessels in rough weather, will save dead or non-paying weight, insure simplicity and economy of construction, and will give greater speed in smooth water, less diminution of speed in rough water, as well as diminished resistance to moving power at all speeds, in all water, and result in shortening the average time of making sea voyages.

"The length of the vessel we are building is more than eleven times its breadth of beam, being 16 feet broad and 180 feet long. This whole length is made available to secure water-lines, which are materially more favourable to fast speed, and also to diminished resistance to moving power at all speeds than the water-lines of any of the sea-going steamers now built, the best of which, looking to speed and ease of movement, have a length of only eight times their breadth of beam. The portion of our vessel not immersed has the same lines as that immersed, so that it will pass easily through the heaviest sea; while, from its form and construction, no water can be shipped that will sensibly augment the load, or endanger the safety of the vessel, which may, we believe, be propelled at its highest speed in rough weather with an impunity which is far from being attainable with vessels, as now built, to be propelled wholly or in part by sails. It is

believed, also, that the plan and position of the propelling wheel in this vessel are such that its minimum hold of the water will be much greater in proportion to tonnage of vessels than the maximum hold of the propelling wheel or wheels in ordinary steamers, thus enabling the full steam power to be applied, with its maximum effect, at all times and uniformly, thus making available those properties of the hull of the vessel which allow it to be propelled at half speed in the roughest sea.

"The engines are high pressure, and have a cut-off that is variable from one-sixth to full stroke. They are four in number, and, combined, will exert threefold more power in proportion to displacement of water than those of the most powerful steam-packets now built.

"The boilers are similar to locomotive boilers in plan and construction, and can consume about 40 tons of coal in 24 hours.

"The above peculiarities of construction, it is believed, will enable the present vessel, even notwithstanding the decided disadvantage she will labour uuder from her small size, to make better speed in smooth water than usual. It is believed, however, that the greatest advantages will be those exhibited in heavy weather, enabling her to exceed the average speed heretofore made upon the ocean.

"Again, the vessel being built entirely of iron, she will be free from all danger from fire, and, from the number of her distinct and water-tight compartments, she will be comparatively free from danger of sinking in case of collision or other mishap, as any one or even several of the compartments might be filled with water without seriously endangering her safety. And further, the form of the vessel, while it makes her stronger than usual, is such as to afford the least possible hold for the wind and waves: so that the danger of injury from heavy seas or storms is small. For these reasons it is believed that the vessel will be an unusually safe one.

"The fact that every portion of the hull or outer shell of the vessel is arched in all directions and the entire material is in the best position and form to resist the various strains that it can be subjected to at sea, gives it an important advantage in point of strength, safety, and buoyancy over any other sea-going vessel.

"The form and construction is remarkably plain and simple, resulting in great economy of material and workmanship, and facility of construction. The less the weight of material, the greater, of course, the capacity for carrying paying freight, and the less will be the resistance to moving power in proportion to such freight. With 200 tons of coal on board, the present vessel will displace about 350 tons of water, and will accommodate about 20 first-class passengers and the United States mail, with room to spare for small valuable packages, specie, &c.

"We believe that shorter average ocean passages than have yet been obtained are desirable, and may be had by vessels constructed on our plan; and if they are confined to carrying passengers, the mail, specie, and such other freight as can well afford to pay a high rate, in consideration of extra dispatch and safety, we believe that they will pay better and be more useful than the vessels now used for these purposes."

We hope the inventors will be careful how they experiment with a vessel of so bad a form. They manifestly are without sound knowledge of the principles of ship building, and they are running a great risk of bringing about a serious disaster.

THE ATLANTIC CABLE.—We are given to understand that the vessel containing a portion of the shore end of the Atlantic cable is knocking about at or near Valentia, but there is no engineer whatever on the spot to control the operation of laying it, or to afford assistance of any kind. Where is Sir Charles Bright ?

AN IMPROVEMENT IN THE MANAGEMENT OF FURNACES.

In the course of a lecture delivered by him at the Literary and Scientific Society of Huddersfield, a few days since, "On the Economy of Fuel and the Prevention of Smoke," Mr. Joseph Hopkinson, of the Britannia Iron Works in that town, reviewed, in historical order, many of the principal contrivances which had been invented, and showed how and why they had failed. He utterly discarded all these and other extra appliances, as being of no use, and then proceeded to detail a simple and efficacious method by which the smoke nuisance may be at once got rid of. This method is one, he said, which may be worked in all kinds of furnaces, and that, too, without additional expense, being solely confined to a particular method of "firing," which he calls alternate firing. The coals are to be laid in large quantities upon one side of the fire only at one firing; and when these are well burned into a heated coke, the other side of the furnace is subjected to the same treatment. By this method, the rapidly evolved gases which escape from the fresh coal on the one side, are raised to a high temperatnre by the heated coke on the other, and, being allowed to mix intimately with a steady current of atmospheric air, which passes up through the centre of the grate, where the fuel is thinly laid, these gases are thereby completely consumed. In conclusion, Mr. Hopkinson detailed a number of extremely successful experiments which he had conducted on this system of firing, with many boilers, both in Huddersfield, Bradford, Leeds, Newcastle, and other places; and showed that thereby a saving was gained of at least 20 per cent. of fuel, and a considerable reduction of boiler room. One instance was mentioned of a firm in the neighbourhood who had been in the habit of using ten boilers to work their mills, but which worked equally well with six on his system, and with a considerable saving of fuel also.

TELEGRAPHIC CABLES.

To the Editors of the Mechanics' Magazine.

Gentlemen,—Permit me to make a few remarks upon the construction of telegraphic cables. First:—That gutta percha is not suitable for submarine purposes; because, when the temperature is low, the substance becomes somewhat brittle; the consequence is, that a cable constructed of gutta percha will break from the conducting wire when any extra strain is given it beyond that which the gutta-percha coating can withstand; and, it is a well-known fact, that gutta percha is a non-elastic gum, hence the objection to use it for submarine telegraphic purposes.

That gutta percha becomes perfectly pliable at 212° Fahrenheit there can be no doubt; and any change in temperature seriously affects it when used for telegraphic cables.

I maintain, therefore, that all cables constructed of gutta percha with spiral-wire covering, as now used, cannot last for any great length of time. There is no doubt on my mind that the Atlantic Cable is rendered inefficient by the elongation of the outer wires, which has caused the gutta percha to snap in various places. I think this will not be disputed by practical men; if it be, I shall be happy to explain myself more fully to those who are acquainted with telegraphic engineering. I would recommend that the Atlantic Telegraph Company should have a cable that will suit all the purposes required, before they consent to another being made of gutta percha. It is undeniable that india rubber is far superior to gutta percha; and, even when the latter is used, the present mode of covering with wire is injurious to any cable, however well insulated.

I also object to the use of spun yarn saturated with tar, as it has a tendency to dissolve gutta percha or india rubber.

I believe there is in existence a far superior method of covering wire than the one used for the Atlantic cable, and which would render the cable lighter and considerably stronger than if it were made by any other means employed for such purposes.

I am, Gentlemen, yours, &c.,

Walter Hall.

10, Pier-road, Erith,
Nov. 22, 1858.

"TESTIMONIAL TO A MASTER SHIPWRIGHT."

To the Editors of the Mechanics' Magazine.

Gentlemen,—A few weeks since you considered it your duty to disapprove of the way promotion in the Royal dockyards had been conferred under the *mistaken* notions of education, and I felt it to be my duty to respond to the justice of your remarks, from my *personal knowledge of the subject.*

In your Number 1841, you consider the tribute of respect to the late master shipwright of Devonport Dockyard, Mr. W. Edye, "*evinces somewhat strongly that peculiarly subservient spirit which so often prostrates our Devonport friends lower than we care to see them.*"

Perhaps it did not strike you, as it did me, the instant I read this peculiarly subservient epistle and its reply, that both come from one and the same person. How-

ever, I know enough of the whole concern to believe that it was a political party concoction, in which that Royal Dockyard has been so notoriously fond of indulging since Devonport became the peculiarly political property of the Whig Admiralty.

Mr. Edye commenced his career in that dockyard as an "oakum boy," and finished it as master shipwright, but your mechanical and professional readers must not suppose that his promotion over the heads f old experienced officers was due to his bility as a mechanic.

Without going back to his progress anterior to the Reform Bill, Mr. Edye took the lead in the dockyard in favour of Sir George Grey, cousin to Sir Charles Wood, then Secretary to the Admiralty, and since First Lord, and was consequently promoted.

Mr. John Edye, with much less mechanical knowledge than himself, was appointed as "professional adviser" to the *intuitive* Surveyor of the Navy, the late Sir William Symonds; and to the Edyes—including Mr. Joseph Edye, a half-pay purser in the navy, and Mr. W. Edye's wife's brother, a half-pay surgeon in the navy, who contrived to keep the public papers full of concocted reports in favour of Symonds' ships—we owe it that they were not abandoned till about 4,000,000*l.* of the public money had been wasted in building and experimenting on the capabilities of those expensive ships.

Whatever the worth of Mr. Edye as a master shipwright may have been, or without entering into an explanation of his *special* services to his patrons beyond that already named, public duty commands me thus far to notice them, with the hope that the present First Lord of the Admiralty, now engaged in reforming our dockyards, will see how far he may be able to correct the baneful influence of political and inappropriate education in those expensive but valuable establishments.

Sir John Pakington appears to see the necessity, and I trust he will be able to carry out his object in a way that will do justice to those whose ability and character should be consulted rightly, before they are promoted to the office of master shipwright; and I respectfully beg to assure him, the Royal dockyards will amply supply the requirements without one fraction of expense to the country, as I have before expressed myself on this important national question.

I am, Gentlemen, yours, &c.,

OBSERVER.

November 22, 1858.

[Mr. W. Edye was, we believe, a very useful officer, but we have given place to the above letter of our correspondent (whose name we are at liberty to communicate) because the ability of Mr. Edye does not do away with the pernicious influences which "Observer" speaks of.—EDS. M.M.

PHILP'S "HISTORY OF PROGRESS."—SWEDENBORG.

GENTLEMEN,—Among other promises in his prospectus, Mr. Philp has signified his intention to raise many British inventors and men of science out of the obscurity into which they have fallen, or rather been forcibly consigned. I applaud the undertaking, and hope that it may be carried out; and in addition to this I would suggest that where the labours of foreigners have become indissolubly connected with any great invention or discovery, the credit which is their due should be plainly set forth. The progress to the present perfection of many inventions, and the perfect discovery of many scientific facts, presents an inextricable web; and, in Mr. Philp's laudable undertaking, I hope that, while seeking to honour many at present unknown benefactors of our country, he will pursue the same course with respect to all those sons of other lands with whom, to be just, he must, I think, come in contact. Progress must have a commencement, but how difficult it is to say with whom any great truth originated!

I know of no man whose scientific suggestions and anticipations have been more neglected than those of Swedenborg. Emmanuel Swedenborg, it is true, is much celebrated for his theological writings, but, as to science, who ever heard his name quoted in the long list from Galileo to the present moment? I never have, and I am afraid that this experience is too universal. Nevertheless, the man deserves no small credit for what he has done; seeing which I would commend him to the attention of Mr. Philp, yet not unless he has produced some effect upon British discovery, which I conceive to be the case.

I hope that you will not consider this appeal unfit for your columns, and allow me to inquire whether a paper upon the scientific merits of Swedenborg will be acceptable; as, if so, I will proceed to the task.

I am, Gentlemen, yours, &c.,

J. ALEX. DAVIES.

Nov. 22, 1858.

[Of the merits of Swedenborg as a man of science, there can be no doubt in any cultivated mind. We shall be happy to receive our correspondent's papers on the subject.—EDS. M.M.]

IMPROVED ELONGATED RIFLE SHOT.

To the Editors of the Mechanics' Magazine.

GENTLEMEN,—I beg to enclose a letter from Lieut. Hans Busk, author of the *Rifleman's Manual*,

"Nov. 17th, 1858.

"My Dear Sir,—I took an opportunity, when in the country yesterday, of trying the twelve paper-coated bullets you handed to me for that purpose. I beg to enclose a diagram, showing the result of twelve shots at 200 yards. The wind was strong across the line of fire, and my eyesight is not as good as it once was, or I should have done better.

"I think very highly of your invention, for, so far as I have been enabled to judge by the above experiment, your system of partially coating the bullet with paper appears to answer all the objects you had in view.

"Believe me to remain, my dear Sir,
"Yours very faithfully,
"HANS BUSK.

"Captain Norton."

Note.—It appears from the target diagram, that the twelve shots all struck within the circle of two feet, and that *six* of them were in the bull's eye.

I am, Sir, yours, &c.,
J. NORTON.

Rosherville, Nov. 19, 1858.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

PELEZ, A. *Improvements in hydraulic machines.* (A communication.) Dated Apr. 1, 1858. (No. 692.)

This invention cannot be described without engravings.

COLETTE, E. A. *Hashing meat with a mechanical chopping-board.* Dated Apr. 1, 1858. (No. 693.)

This invention cannot be described without engravings.

DADLEY, A. P., and N. BROUGH. *An improved buckle or metallic adjuster for adjusting braces, belts, garters, and such like articles of dress.* Dated Apr. 1, 1858. (No. 694.)

The object here is to so make buckles, &c., that their mechanical tendency shall be to securely grip the fabric or band. The method of effecting this cannot be described without engravings.

TAVERNIER, F. R., and J. A. F. *Improvements in machinery for combing wool or other fibrous materials.* Dated Apr. 1, 1858. (No. 695.)

This consists, 1. In taking the sliver of wool, &c., keeping it at a fixed level, and lashing it with a lashing comb—that is, a comb is caused to strike into the sliver, such comb then remaining in a fixed position with respect to the sliver. 2. Lashing the sliver with a second and similar comb, striking it in like manner tangentially to and within the first comb, and remaining like it in the same position with respect to the sliver. 3. Lashing the sliver with a third comb acting in a similar manner. 4. Causing these three combs to advance in a direction parallel to each other, but at different velocities, the first moving forward more rapidly than the second, and the second than the third, so that the sliver head is torn and combed front and back at the same time without fracture or waste, there being no point of detention nor looping over the back of the comb. 5. The work is to be continued by the successive introduction into the sliver of fresh sets of combs, acting in a similar manner, and having a like differential motion to the three first named, the combing being completed by drawing rollers working with regular and continuous action.

OOSTERLINCK, F. J. E. *An improved valve or plug for the passage of water or other fluids.* Dated Apr. 1, 1858. (No. 696.)

This invention cannot be described without engravings.

WARD, H. *Improved machinery for expressing liquids from organic substances.* Dated Apr. 1, 1858. (No. 697.)

The patentee claims the use of a reciprocating plunger in combination with a compressing chamber, for separating the fluid from the fibrous portions of the substance submitted to pressure, and discharging the same into separate receptacles by one continuous operation.

NEWTON, W. E. *Improved machinery for manufacturing corks.* (A communication.) Dated Apr. 1, 1858. (No. 698.)

This consists of a cylindrical knife having an internal diameter equal to that of the corks to be made. This knife has a rotary motion imparted to it, and against it the piece of cork is pressed by a reciprocating bar. The shaft of the knife is hollow, and forms a guide through which the finished corks are discharged from the machine.

BOARDMAN, T., and J. ALLCOCK. *Improvements in looms.* Dated Apr. 1, 1858. (No. 700.)

This consists, 1. Of an arrangement of mechanism for making two or more shuttles. 2. Of a positive shedding motion for acting on any number of healds. The patentee claims, 1. The use of two ratchet wheels, having teeth in contrary directions, so that motion may be given either way to a pattern plate acting on two or more shuttles, and thus cause an indefinite number of changes. 2. The use of pins on a pattern chain for raising the catches which work the ratchet wheels, thereby giving more or less dwell, and forming the pattern. 3. The use of rods having under and over hooks in connexion with intermediate levers and springs acted upon by pattern pegs, and also the moveable grids for closing the shed. 4. The general arrangement.

RUSSELL, C. G. *Improvements in machinery or apparatus for printing.* Dated Apr. 1, 1858. (No. 701.)

This consists in applying to printing cylinders, whether of metal, wood, or stone, two pairs of inking rollers in connexion with a damping apparatus, and, instead of the ink tables, the patentee employs an expanding and contracting drum or cylinder supplied with the exact quantity of ink for each impression by a pair of distributing rollers coming in contact with it. The expansion and contraction of the cylinder is for adapting it to the exact diameter of the printing cylinder, so that the speed of both circumferences shall be uniform.

ROBINSON, T. F. *Improvements in apparatus for cutting cork.* Dated Apr. 1, 1858. (No. 702.)

The patentee employs a circular knife affixed to an axis to which rotary motion is given, and this axis is operated by a screw thread, so that during the operation of cutting a piece of cork into a cylindrical, conical, or other form, the knife carried thereby may progressively cut from the outer surface gradually to the depth desired, thereby paring off the outer surface from a larger to any desired smaller diameter, and by which also the knife may be adapted to the cutting of cylinders or cones, or such like forms, of various diameters. There are several modifications included.

PELEZ, A. *A new apparatus for deepening rivers and rendering them navigable.* (A communication.) Dated Apr. 3, 1858. (No. 704.)

This invention cannot be described without engravings.

GACHRAINE, V. *An improvement in the construction of steam engines for the use of vessels.* Dated Apr. 3, 1858. (No. 705.)

This invention cannot be described without engravings.

PELEZ, A. *A circular cutter.* (A communication.) Dated Apr. 3, 1858. (No. 706.)

This invention cannot be described without engravings.

PELEZ, A. *A new steam piston for horizontal and vertical engines.* (A communication.) Dated Apr. 3, 1858. (No. 707.)

This steam piston is without an assemblage of

plates, and with an encircling cam inside for horizontal machines, and with conical segments and without an encircling cam for vertical machines, the conical segments having at one of their extremities plates for the crossing of the pieces cut in the shape of a circular conical wedge with a jointed rod with two inclined cones. The invention cannot be intelligibly described without engravings.

JOHNSON, J. H. *Improvements in ships' propellers.* (A communication.) Dated Apr. 3, 1858. (No. 708.)

The time for filing the final specification of this invention has been extended.

TRESS, C. *Improvements in or applicable to the class of hats made from palm leaf, grass, chip, Tuscan, Leghorn, Panama straw, and other like materials.* Dated Apr. 3, 1858. (No. 709.)

This consists in the application of a band to the low part of the crown of the hat, which band is intended to give strength and fineness to the crown and brim of the hat, and to enable the hat to keep its shape.

FOWLER, J., jun. *Improvements in apparatus used when ploughing, tilling, or cultivating land by steam power.* Dated Apr. 3, 1858. (No. 710.)

This consists in applying two steam engines mounted on separate carriages, to haul ploughs, &c., so that the power of the two engines is applied at the same time. Two engines, each with a pair of grooved drums, one or both driven by the engine, are placed opposite to each other, one on each headland, and an endless rope passes from one engine to the other, and takes two or three turns round the drums of each engine. The implement is attached to the rope, and is hauled by it backwards and forwards over the land between the two engines.

CROWLEY, W. *Improvements in combining and working ploughs.* Dated Apr. 3, 1858. (No. 711.)

Here double ploughs are used, that is, ploughs with two mould boards connected together, back to back, so that when one is working with its share and coulter to produce a furrow, the other and its share are raised to an angle with the bottom of the furrow, the point of the share being upwards. The beam of each plough has two wheels at each end, with means of adjusting their depth. Two or more such ploughs are combined to a frame at each end. The draft chain of each plough is fixed to the hinder bar of the frame. The other ends of the beams are attached to the hinder bar of the other frame, in such manner that when two bars of the frames to which the ends of the beams are connected are at right angles to the line of the furrows the ploughs will be at their greatest distances apart; but when the hinder bars of the frames are inclined to the line of the furrows, then the ploughs will work nearer together. The draft is alternately applied to the two drafts and frames on one side, so that the bar to which the draft is applied causes the hinder part of the frame to be on a line inclined to the line of the furrows, and the ploughs will work one in advance of another. When the ploughs come near the end of a "bout" the point of attachment is changed, to draw the end frame somewhat further, by which the back bar of the frame will be made at right angles to the line of the furrow, and the ploughs will separate to their greatest distances apart. The ploughs are then tilted, and the draft appled to the other end frame, to cause the hinder bar of that frame to be inclined to the line of the furrows, by which the ploughs will again come nearer together, and form a new furrow parallel to the previous furrows.

CARTWRIGHT, H. *Improvements in the construction of eccentrics, and in the mode of working them when applied to steam engines.* Dated Apr. 3, 1858. (No. 713.)

The patentee wishes to give to the steam cocks or steam valves which supply the cylinder with steam what is technically called "lead," in whichever direction they are moving. The invention cannot be described without engravings.

EDWARDS, E. *An improvement or improvements in the manufacture of glass finger plates for doors and other articles of like manufacture.* Dated Apr. 3, 1858. (No. 714.)

This consists in manufacturing glass finger-plates for doors, &c., flat, or nearly flat, on one side, by moulding the said articles on the exterior of a vessel, which vessel is afterwards divided, and the articles detached from the superfluous glass, and finished by being ground at the back.

MINTON, S., and R. H. THOMAS. *An improved construction of battery.* Dated Apr. 3, 1858. (No. 715.)

This consists in the construction of floating caissons, filled with guns, and capable of receiving an axial motion for bringing them to bear upon any given spot within the circumferential range of the battery.

CLARK, W. *An improved construction of water tank for ships and other vessels, and mode of applying the same on board a vessel, whereby it is capable of conversion into a float for saving life and property, in case of the foundering of the vessel.* (A communication.) Dated Apr. 5, 1858. (No. 719.)

The various features mentioned in the title of this invention cannot be described without engravings.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

BENTLEY, H. *Certain improvements in machinery or apparatus employed in preparing and spinning worsted and other fibrous substances.* Dated Apr. 1, 1858. (No. 699.)

These relate to covering the top rollers with leather, &c., and consist in having such rollers formed with a web plate or arms in the middle of the rim, or so that the rim projects on each side thereof, and which rim is bevelled on the inner edges. The inventor also has plates or rings, which are bevelled on the outer edge so as to fit into and between the rim on each side of the roller, the said plates or rings being roughed or toothed on the bevel edge.

GREENSHIELDS, T. *Improvements in treating ammoniacal liquor produced from coal in making gas, and obtaining useful products for making artificial manure.* Dated Apr. 3, 1858. (No. 703.)

This consists in first subjecting the ammoniacal liquor to the action of sulphate of lime reduced to powder.

MORRISON, D. *Improvements in boiling oils.* Dated Apr. 3, 1858. (No. 712.)

This consists in the use of boilers having a very extensive tubular heating surface within the boiler; and, to obtain the high degree of heat necessary, high-pressure steam is used in the interior of such tubes.

TARGETT, R. *Improvements applicable to lamp glasses or shades.* Dated Apr. 3, 1858. (No. 716.)

The object here is to admit of glass covers being applied to any of the ordinary lamp glasses or shades. The inventor provides a metal ring or rim in which the cover is supported, and this ring, having arms or clips capable of catching on the top edge of the lamp glass or shade, will hold the cover in its place on the top of the shade, leaving a space between the shade and the cover for the escape of the hot air.

NEWTON, A. V. *Improvements in machinery for cutting veneers.* (A communication.) Dated Apr. 3, 1858. (No. 717.)

This relates to improvements on a previous patent of the patentee, dated 11th of May, 1857. The present invention dispenses with the turn-table in the original machine, and all the feed attachments and appendages thereon, and new arrangements applied.

STOBBS, J., and G. R. HALL. *Improvements in pumps for raising water and other liquids.* Dated Apr. 3, 1858. (No. 718.)

This consists in combining the barrels of two or more pumps placed side by side, the barrel of each pump (excepting that in which the first lift takes place) having at its lower end an air-tight box, each

placed one above the other, so as to receive the contents of the lowermost barrel with which it is in immediate connexion, and so on for each succeeding barrel. The contents of each of the boxes are raised by the bucket of its respective barrel; or, instead of using the boxes or cisterns, each barrel may be connected to the other by a sloping branch pipe. It is proposed to impart motion to the buckets by a three or more throw crank shaft, the cranks being so arranged as to cause one or more of the buckets to be ascending whilst others are descending.

Dieulafait, J. C. *An improved method of manufacturing garments, whereby one garment may be changed in form to that of several others.* Dated Apr. 5, 1858. (No. 721.)

This consists in making garments, the shape of which may be modified at will, by using buttons or hooks and eyes, or both, for concealing certain parts of the garments, and adding certain other parts.

Groombridge, R. C. H. and H., and J. Musselwhite. *Improvements in a black-board and apparatus for teaching music.* Dated Apr. 5, 1858. (No. 723.)

This consists in constructing a black-board or framework inlaid or overlaid with cork, upon which the five lines of the musical stave are drawn, or across which wires may be strained, to render the musical stave well defined. Also in constructing musical notes with pointed stems, so that they may be readily inserted in the cork.

Van Elven, L. T. *Improvements in apparatuses for raising and lowering weights and bodies.* Dated Apr. 6, 1858. (No. 726.)

The inventor connects to the four corners of a case grooved rollers, which are caused by springs to run in, and be pressed against upright rails or frames. The top of the case is connected to one end of a belt, carried over pulleys held by links from a cross-bar, while the other end of the belt is connected to counterbalance weights. The raising or lowering is effected by winding up or winding off a belt or rope connected to the case.

Webster, W. B. *An improvement in the making of butter.* Dated Apr. 6, 1858. (No. 727.)

This consists in forcing air into milk or cream.

Wetherell, H., and G. Gray. *An apparatus for preventing down draughts and currents in chimneys, flues, and shafts.* Dated Apr. 6, 1858. (No. 728.)

For preventing down draughts in chimneys, flues, &c., the inventors fit a seat in the chimney, and above the seat suspend a globe filled with gas lighter than air. See *Mech. Mag.*, p. 419, No. 1815, Vol. 68.

Owen, E. *Improvements in the manufacture or production of artificial fuel, and in the application of the same to metallurgical purposes.* Dated Apr. 6, 1858. (No. 729.)

These improvements consist in reducing peat charcoal to a fine powder, and mixing it with coal tar, pitch, or any bituminous substance, to render the mass plastic. The material, in the form of rude blocks, is recarbonized, as the carbonization of coal is effected in gasworks.

Camp, J. *An improved construction of expanding portfolio.* Dated Apr. 6, 1858. (No. 730.)

This portfolio is of two parts, the back piece forming part of one of the lids, and the other lid being provided with a pocket to receive the inner edge of the back. By bands the back is connected with the pocket lid, so that the back may be slidden into the pocket, or drawn out, as required to suit the thickness of papers contained. In the back piece a series of threads lie, for securing the papers in place.

Schwinitzer, H., J. Holder, and J. Broughton. *Concentrating and retaining the valuable properties of farm-yard and stable manure.* Dated Apr. 6, 1858. (No. 733.)

The inventors dilute sulphuric acid with 14 times its bulk of water, then saturate it with powdered dolomite, heat it, and filter it. They also digest powdered dolomite with heated hydrochloric acid, and strain off. They then mix the two solutions, strain off, precipitate, and add ammoniacal salts and nitric acid. They claim the use of salts of magnesia combined with ammoniacal salts.

Eckmann, J. *Improvements in galvanic batteries.* Dated Apr. 6, 1858. (No. 734.)

The inventor applies to the metallic elements of a battery a motion whereby each pair of plates are alternately fully immersed, and then, for the most part, withdrawn from the liquids and exposed to the air by mechanism; and, at the same time, he applies brushes of reed and horsehair, whereby the surfaces of the plates are cleansed of deposits.

Blanche, B. *Using Malacca and Manilla cane instead of whalebone.* Dated Apr. 6, 1858. (No. 736.)

The inventor obtains the strips by dividing the cane into sections. The heart may be dispensed with, using only the outer portion of the cane.

Sangster, J. *Glazing in wood without putty.* Dated Apr. 6, 1858. (No. 737.)

This consists in fixing glass in woodwork, for horticultural and other purposes, without putty, by rabbeting and grooving the frames in a particular way, and applying brass plates, &c.

Rose, J. *Apparatus for applying heat, cold, moisture, fumes, vapours, and other agents in medicine and surgery.* (A communication.) Dated Apr. 6, 1858. (No. 738.)

This consists of a heater or cooler for air, or a generator for steam, &c., and a bellows or suction apparatus, with pipes, for bringing hot or cold air, vapour, or fumes, into contact with the body.

Collyer, R. H. *Improvements in the manufacture of paper.* (A communication.) Dated Apr. 6, 1858. (No. 739.)

This consists in submitting straw while whole to the action of alkali, by placing the material upon a raised perforated floor of an open vessel heated by steam, so that a descending current of hot alkaline solution and an ascending volume of steam will operate. The alkali being run off after boiling, the material is transferred to the ordinary rag engine. Then, or subsequently, when reduced to fibre, acid sufficient to neutralise and remove the alkali still remaining is added, and then washed out. The roller of the rag engine then opens the straw into lint or fibre while washing, and when sufficiently reduced the bleaching liquor is added, and the whole run down into the sleeping chests. It can then be beat by itself or with other materials.

Casartelli, A. and L. *Improvements in pressure and vacuum gauges.* Dated Apr. 7, 1858. (No. 741.)

The improved gauge consists of a cylinder, piston, and spring, with a quadrant and pinion acting upon a finger or hand on a dial.

Haines, F. *The application of manufactured india rubber as a substitute for whalebone, steel ribs, and other like articles, to various parts of ladies' dress.* Dated Apr. 7, 1858. (No. 742.)

The inventor uses manufactured india rubber for every purpose for which whalebone, steel, &c., are used.

Wright, J. *Improvements in the mode of treating leather to render it waterproof.* (A communication.) Dated Apr. 7, 1858. (No. 744.)

The inventor splits leather into two or more pieces, and then coats one of the surfaces (preferably the split surface) with india rubber or gutta percha, or a compound of both, or with a solution of shellac, or of gums insoluble in water. The two surfaces coated are then put together and subjected to great pressure, forming one piece quite impervious to damp. Two or more of these sheets may be treated in the same manner as a single pair.

Worthy, R. *An apparatus for preparing medical fomentations.* Dated Apr. 7, 1858. (No. 746.)

This is to afford a ready means for preparing medical fomentations by steam, and consists of an

apparatus in which is a boiler (heated by a spirit lamp) and a steam chamber communicating with the boiler by pipes.

CLARK, W. *A burner for candles.* (A communication.) Dated Apr. 8, 1858. (No. 759.)

This consists in the application of a small socket formed by a capsule surmounted by a small sheath or case which encircles the wick.

PROVISIONAL PROTECTIONS.

Dated September 27, 1858.

2162. E. L. Benzon, of Sheffield, steel manufacturer. Improvements in the manufacture of steel. A communication from F. A. Lohage, of Unna, Prussia.

Dated September 29, 1858.

2172. G. T. Bousfield, of Brixton. Improvements in apparatus for, and in the manufacture of paper bags and other similar articles. A communication.

Dated October 1, 1858.

2190. T. Preston, of Nottingham, manufacturer. Improvements in the manufacture of looped fabrics.

Dated October 8, 1858.

2236. E. V. Rippingille, of Chorlton-upon-Medlock, Manchester, artist. The improvement of fire-arms and artillery.

Dated October 20, 1858.

2342. P. C. Storts, of Liverpool, photographer. Improvements in the materials of photographic plates.

Dated October 21, 1858.

2350. C. W. Williams, of Liverpool, gentleman, and G. Eyton, of the same place, chemist. Improvements in the construction of locomotive and other steam boilers.

Dated October 27, 1858.

2394. L. Wray, of Devonshire-st., Portland-pl. The preparation and application of a substitute for gutta percha, caoutchouc, and similar substances.

Dated November 1, 1858.

2430. C. Vero and J. Everitt, of Atherstone, hat manufacturers. Improvements in the manufacture of hats and other coverings for the head, a part of which improvements is also applicable to the manufacture of felt.

2432. J. Dobson and D. Pearce, of St. James's-st., glass manufacturers. Improvements in the manufacture of bird-cages.

2434. E. Maynard, of Brooklyn, U. S. A. Improvements in submarine telegraph cables.

2436. W. Palmer, of New York. Improvements in fire-arms.

Daed November 2, 1858.

2440. D. Tomasini, of Store-st., Bedford-sq., upholsterer. Improvements in respirators.

2442. R. C. Smith, of Birmingham, glass mould maker. A new or improved buoy or wreck intelligencer.

2444. M. L. J. Lavater, of the Strand, india-rubber manufacturer. Improvements in cartridges for military and other purposes.

2446. D. D. Kyle, of Albany-st., Regent's-park. Improvements in boots and shoes.

2448. A. McDougall, of Manchester, manufacturing chemist. Improvements in the construction of reservoirs, tanks, culverts, sea-walls, and other erections required to exclude water or damp.

Dated November 3, 1858.

2450. S. Bottomley, of Bradford, York, warehouseman. Improvements in the manufacture of moreens and other fabrics of a similar character.

2452. H. Tertian-Moret, of Welbeck-st. The application of a mineral, named Deterso, as a disinfecting, preserving, absorbing, and curative powder.

2454. J. Tall, of Collingwood-st., Blackfriars-road, engineer. Improvements in brushes or brooms for sweeping floors, carpets, and other similar articles.

2456. P. A. Mawdsley, of Seacombe, Chester, smalt manufacturer. Improved machinery or apparatus for drying yarns after being sized or stiffened, and the use or application of a certain substance or substances, in the sizing, stiffening, or otherwise preparing yarns and woven fabrics, or either of them.

2458. J. Fowler, jun., R. Burton, and D. Greig, all of Cornhill. Improvements in applying motive power to actuate ploughs and other agricultural implements.

Dated November 4, 1858.

2460. E. Fielding, of Todmorden, factory operative. An improved method of preserving the form of cops of yarn by the application of adhesive substances.

2462. C. F. Vasserot, of Essex-st., Strand. Improved driving machinery applicable for thrashing grain and other agricultural purposes. A communication from A. Bauquin, of Nantes.

2464. J. R. Napier, of Glasgow, civil engineer. Improvements in obtaining motive power by means of heat.

2466. W. T. Mabley, of Manchester, mechanical engineer. Improvements in printing and dyeing woven fabrics. A communication.

2468. I. Baggs, of Kennington, electrical engineer. Improvements in telegraphing by electricity.

Dated November 5, 1858.

2470. W. H. Tooth, of Islington, engineer. Improvements in the manufacture and construction of fire or furnace bars.

2472. T. B. Smith, of Marietta, U. S. A. Preparing wood, so as to be used as a substitute for curled hair in the manufacture of mattresses, and in the other purposes to which curled hair and its substitutes are applied.

2474. E. Rowland and J. Dewhurst, of Manchester, engineers. Certain improvements in steam engines, and in the valves connected therewith, which said improvements in valves are also applicable to safety valves.

2476. C. Mills, of Camden-town. Improvements in the action of pianofortes.

2478. S. Davey, of Rouen, France, merchant. Improvements in blasting powder.

PATENTS APPLIED FOR WITH COMPLETE SPECIFICATIONS.

2560. T. R. Butcher, F. Stevens, W. T. Johnson, and T. Jarvis, of Frome, pianoforte action makers. Improvements in the hammer-rails of pianofortes. Dated Nov. 15, 1858.

2575. C. J. O. Perry, of Williams-town, Victoria, Member of the Legislative Assembly. An instrument to be used chiefly on board ship for approximating in certain cases the course of an approaching vessel either in the day or night, and the relative angle of both ships' courses, in order to avoid a collision, to be called Perry's anti-collision dial. Dated Nov. 16, 1858.

NOTICES OF INTENTION TO PROCEED.

(From the "London Gazette," November 23rd, 1858.)

1560. J. Macintosh. Confectionery.
1572. J. Edwards and T. Newey. Blind furniture.
1576. W. Beadon. Bags; ships' sails.
1578. E. J. Maumené and L. B. Jaunay. Sparkling wines.
1583. F. Chapusot and V. Avril. Producing a vacuum.
1584. J. Jones. Meters.
1591. J. Fowler, jun. Ploughing, &c.
1595. C. P. Aston. Fire-arms.
1602. W. Betts. Capsules.
1622. H. Smith. Harrows.
1630. S. Maw. Feeder.
1637. C. Doley, E. Bigland, and T. H. Worrall. Ornamenting surfaces.
1640. W. N. Nicholson. Crushing-mills.
1656. J. B. P. A. Thierry, jun. Furnaces.
1657. A. B. Tripler. Obtaining products from a species of asphaltum.
1661. R. P. Walker. Hulling grains.
1671. J. F. Belleville. Smoke consumer.
1690. J. Scott. Pumps; propelling vessels.
1697. A. Kellermann. Dyeing.
1698. A. Pougault. Steam engines.
1747. S. Hine. Twisting silk, &c.
1921. H. B. Barlow. Lubricators. A communication.
1929. R. A. Brooman. Treating vegetable substances. A communication.
1959. J. Brazil and J. McKinnell. Indigo blue dyeing. A communication.
1961. J. Brazil and J. McKinnell. Indigo blue dyeing.
1976. D. and J. Heyworth. Looms.
2141. J. Wilson. Floating docks.
2162. E. L. Benson. Steel. A communication.
2190. T. Preston. Looped fabrics.
2350. C. W. Williams. Steam boilers.
2361. J. and W. Bagnall. Iron.
2430. C. Vero and J. Everitt. Hats, &c.
2450. S. Bottomley. Moreens, &c.
2464. J. R. Napier. Motive power.

The full Titles of the Patents in the above List can be ascertained by referring back to their numbers in the Lists of Provisional Protections previously published.

Opposition can be entered to the granting of a Patent to any of the parties in the above List who have given notice of their intention to proceed, within twenty-one days from the date of the Gazette in which the notice appears, by leaving at the Commissioners' office particulars in writing of the objection to the application.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

2541. T. Hitt.
2582. C. Crum and C. Paul.
2587. J. Yates and T. R. Birch.
2602. W. Smith.
2612. A. V. Newton.
2614. W. Harvey.
2617. E. O. W. Whitehouse.
2618. D. S. Price and E. C. Nicholson.
2619. D. S. Price and E. C. Nicholson.
2622. C. Defries.
2623. A. Tolhausen.
2631. J. Roberts, jun.
2637. C. T. Dunlop.
2639. C. May and P. Prince.
2641. A. D. Lacy.
2659. F. Coignet.
2664. J. Clark.
2683. C. J. B. Barbier.
2799. R. A. Whytlaw and J. Steven.
2856. A. Small.
2922. S. Sawyer.

LIST OF SEALED PATENTS.

Sealed November 19th, 1858.

856. J. M. Rowan and T. R. Horton.
1123. M. Brun.
1125. H. Brierly.
1131. F. C. Bakewell.
1136. S. Bryer.
1140. P. Féron.
1150. G. White.
1151. A. Ellissen.
1152. I. Baggs.
1164. G. W. Morse.
1192. W. Clark.
1226. J. Austin and J. Armstrong.
1235. J. Mannhardt.
1264. J. H. Johnson.
1980. A. V. Newton.
1990. W. E. Newton.

Sealed November 23rd, 1858.

1155. R. L. Hattersley.
1163. W. Webster.
1165. W. Webster.
1170. J. F. Belleville.
1171. J. Courage.
1184. P. A. Fourgassié.
1185. M. Henry.
1203. L. Tindall.
1217. M. Henry.
1219. J. Young and J. Strang.
1242. R. Roberts and W. Shaw.
1251. J. Mitchell.
1269. E. Cooke and G. Dickenson.
1331. L. F. Lemière.
1341. J. H. Young.
1347. J. C. Henderson.
1367. G. Davies.
1373. A. Dawson.
1379. R. S. Newall.
1397. J. Crossley.
1406. G. Schaub.
1429. J. H. Johnson.
1559. J. Loach and J. Cox.
1599. T. Bartlett.
1951. G. White.
1985. J. Sloper.
2135. A. B. Childs.
2153. R. Romaine.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions.

LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

Dates of Registration.	Nos. in the Register.	Proprietors' Names.	Addresses.	Subjects of Design.
Nov. 2	4129	D. Jones	Birmingham	Cinder Sifter.
3	4130	Sadler and Davis	Birmingham	Hinge.
4	4131	E. P. Capper	Australia	Well Bucket.
16	4132	B. Edgington	Southwark	Support for Tent Poles.
22	4133	Smith and Ashby	Stamford	Feed Roller.

PROVISIONAL REGISTRATIONS.

Oct. 29	1021	W. J. Oliver	Shadwell	Boat.

PROVISIONAL REGISTRATIONS (*continued*).

Dates of Registration.	Nos. in the Register.	Proprietors' Names.	Addresses.	Subjects of Design.
Nov. 2	1022	P. Currie	Birmingham	Fastener.
13	1023	G. Kane	Dublin	Handle.
13	1024	G. Kane	Dublin	Bedstead.
15	1025	Parker and Thompson	Sheffield	Spokeshave.

NOTICES TO CORRESPONDENTS.

We are obliged to several correspondents for letters on the New Series of the "MECHANICS' MAGAZINE: AND JOURNAL OF ENGINEERING, AGRICULTURAL MACHINERY, MANUFACTURES, AND SHIPBUILDING," of which the First Number will appear on the 31st December.

J. Tatlock and *D. McCrae* will be attended to in our next.

Articles and Correspondence designed for insertion in the ensuing Numbers of the *Mechanics' Magazine* must reach the Office by the Tuesday of each week, at the latest. It is highly desirable that they should be forwarded earlier if possible.

CONTENTS OF THIS NUMBER.

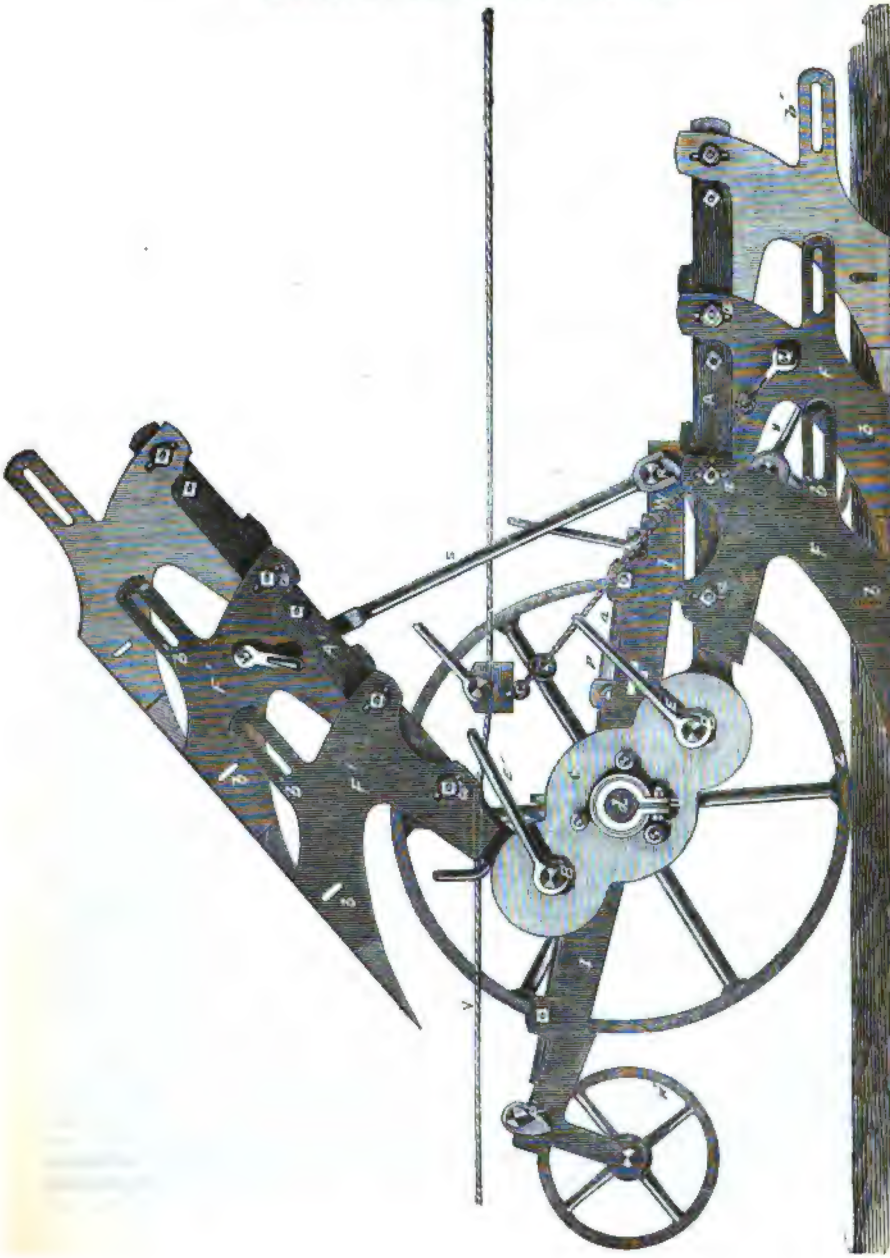
LONDON: Printed and Published by Richard Archibald Brooman, of 166, Fleet-street, in the City of London. Sold by A. and W. Galignani, Rue Vivienne, Paris; Hodges and Smith, Dublin; W. C. Campbell and Co., Hamburgh.

Mechanics' Magazine.

No. 1843.] SATURDAY, DECEMBER 4, 1858. [PRICE 3D.

Edited by R. A. Brooman and E. J. Reed, 166, Fleet-street, London, E.C.

SEAMAN'S PATENT STEAM PLOUGH.



SEAMAN'S PATENT STEAM PLOUGH.

Mr. Joseph Seaman, lately in the employ of Messrs. Howard and Co., of the Britannia Iron Works, Bedford, has patented certain "improvements in machinery or apparatus for effecting the working or cultivation of land, and in the means of driving the same." His invention relates, firstly, to apparatus for effecting the ploughing or other cultivation of land by steam power; and, secondly, to a mode of driving apparatus. The improved cultivating machine may be fitted with ploughs (or other cultivating implements) for working the soil, as occasion may require. The ploughs are carried on two frames or beams, which are furnished with joints so as to work on diametrically opposite sides of a drum or barrel, which is supported upon the main axle of the machine; these joints are, when required, made rigid, to set the ploughs at any angle with the axle. The second portion of his invention consists in the use of a separate draught rope or chain for coupling the machine to the endless chain, rope, or band extending over the length of ground to be operated upon. This chain, rope, or band is carried by suitable pulleys fitted in frames mounted upon trucks, and placed upon portable rails or trams at each end of the land, a steam engine being placed on a similar truck in conjunction with the two end trucks, and working a large actuating driver or pulley. The cultivating machine is connected to the endless chain by a suitable coupling apparatus carried by the machine, the coupling apparatus being so made as to readily grip the chain, or be disconnected therefrom as required.

The motion of the trucks carrying the pulleys at the land's end for the purpose of keeping the endless chain or rope over the work, may be obtained by placing a toothed wheel on the main shaft of the actuating pulley, the teeth of which wheel are brought into gear with a stationary chain forming a species of rack, which thus enables the trucks carrying the engine and pulleys to move themselves along by the rotation of the pulleys. This second part of the invention is equally applicable to the hauling of reaping machines and other agricultural implements over the land which may not be actually used as soil disintegrators or workers.

The engraving on the preceding page represents a side elevation of the cultivating machine, as fitted up for ploughing, the near wheel and the ploughshares and turnfurrows being removed. The machine itself consists of two beams, A, A′, each beam carrying three plough bodies, and being jointed or hinged so as to turn freely on centres at B, B′, such centres being on opposite sides of a central barrel, C, which is capable of turning freely on the main axle of the machine. When required the joints, B, B′, are made rigid or fixed by turning the lever handles, E, E′, which by means of screw spindles passing through and forming the pins of the joints, squeeze the sides or jaws of such joints firmly together, and consequently hold the beams fixed in any desired position. By the combination of the working centres, B and C, facility is afforded for adjusting the ploughs or other cultivating instruments at any desired angle with the ground, and at any required height therefrom, or depth therein; hence a perfect command of the cultivating instruments is readily obtained. The points or ploughs on the two sets of beams, A, A′, are so arranged and fitted respectively with right and left turnfurrows that each set may be used alternately, the machine passing to and fro over the surface of the ground without the necessity for turning it at the headlands. The plough frames, F, F′, are severally made adjustable in height and inclination independently of the supporting beams; this adjustment is accomplished by making slots in the plough frames at the points of attachment to the beams, as shown at *a*, *a*′. He also proposes to make the turnfurrows adjustable on the plough frames by using slots, as shown at *b*, *b*′; in both cases the contact surfaces are roughened slightly to increase their hold. A small angular stud piece is bolted on to the side of the plough frame, and serves to take the breast. The advantage of this form of frame is, that it can be cut out of a flat plate of wrought iron, the portion called the frame being one flat piece of a uniform thickness throughout. The beam which is out of action is elevated by turning it up on its centres, B and C, and is there retained by the tightening screws and levers, E, before referred to, the inner faces of the cheeks or jaws of the joint at B being roughened to increase their holding powers. The drum or barrel, C, is maintained in any desired position by a friction strap or break, which embraces the barrel and is secured to the axle itself, a handle and screw spindle serving to tighten the break when requisite. The main axle on the land side is fitted with a balance beam, I, which carries at each extremity a small steerage wheel, K, K′. This beam is capable of having either end depressed, so as to bring either steerage wheel into action, according to the direction in which the machine is travelling, the steerage wheel in all cases following the main running wheel, L. The end of the axle which carries the wheel, L, is jointed by a vertical pin to the other part of the axle, so as to enable the

wheel, L, to be set at any desired angle with the machine, and so effect the steerage or guiding thereof. This adjustment may be accomplished by means of a rack connected by an arm with the main portion of the axle, and a pinion, P, fast on the steerage shaft, Q, which is carried in bearings in the side of the balance beam, I, the whole steerage apparatus vibrating together vertically on the main axle as a common centre, so that the pinion will always be in gear with the rack. R, R′ are bearing bars fitted loosely into each end of the beam, I, and serving in conjunction with the prop or support, S, to take the weight of the upper plough beam. In order to regulate the width between the two main running wheels, he makes the end of the axle next the furrow wheel telescopic, an opening, *d*, being made longitudinally therein, into which a correspondingly shaped shank is inserted, which shank carries a vertical screw and hand wheel, T, for adjusting the height of the furrow wheel, the axis of which wheel slides vertically along the screw spindle within an enclosing metal box or cylinder. The split ring, U, serves to grip or tighten the outer portion of the axle over the part which slides within it, when the proper width between the running wheels has been obtained. He employs an endless rope or chain for dragging the machine over the ground when working, but, in place of attaching the machine direct to the endless traction rope, he connects it therewith by the aid of a separate draught rope or chain, which is hooked at one end to a plough frame, and is connected at the opposite end by a clutch with the endless rope. This clutch is made to grip the rope, and is tightened thereon by a screw and lever, *e*, so that when the machine is arrived at one end of the field the attendant has merely to turn the lever, *e*, when the clutch will be released from the endless rope, and the machine will of course stop; the endless rope being allowed to continue its course without interruption; the machine is readily started again by simply screwing up the clutch, when the draught immediately comes into operation again. By this simple clutch arrangement, the necessity for signalling to the engineman to stop his engine is altogether dispensed with, except for reversing the same when the machine returns again. Two grooved pulleys (round which the rope is passed), carried by travelling trucks or platforms, are placed at each end of the field; and the main actuating pulley round which the rope is wound one or more times. This pulley is worked by suitable reversing gear from any convenient farm engine, which engine, with the pulley, is supported on a travelling platform, the whole being moved along by a chain or rope anchored ahead, and wound on to a drum on the engine. The endless traction rope passes round pulleys and twice round the large pulley, which latter serves also as a tension pulley for keeping the rope continually stretched tight. After each traverse of the machine across the field, the end trucks or platforms are moved forward along temporary rails by the attendants, and the main drum is correspondingly moved by the aid of the chain and anchor above referred to, when the machine will be in readiness for cutting the next succeeding furrows. The trucks carrying the pulleys may be filled with stones or earth to keep them firm, and should be fitted each with a pair of small travelling wheels.

RAILWAY GRADIENTS AND CURVES.

The Paper read at the Institution of Civil Engineers, Nov. 23, 1858, Joseph Locke, Esq., M.P., President, in the chair, was "On the Successful Working, by Locomotive Power, over Gradients of 1 in 17, and Curves of 300 feet radius, on Inclines in America," by Mr. T. S. Isaac.

It was stated, that the road which had decidedly taken the lead in the United States, in the application of locomotive power to steep gradients, and had been generally the pioneer of improvements, was that extending from Baltimore, on the Chesapeake-bay, to Wheeling on the Ohio river, a distance of three hundred and eighty miles, through a region of considerable difficulties, especially in the various ranges of the Alleghany Mountains. This Company was incorporated in 1827, being the first chartered in America, and a portion of the road was opened in May, 1830. At first it was worked by horses, but locomotives were employed as early as August, 1830,—prior to the opening of the Liverpool and Manchester Railway. It was not until 1851 that the great incline over the main range of the Alleghanies was completed and worked by locomotives. It had an inclination of 1 in 45½ for eleven continuous miles, and, after winding amongst the summits of the mountains for twenty miles, it descended, on the western side, with an inclination of 1 in 45½ for nine continuous miles. The passage of this mountain chain involved altogether sixty miles of railway, twenty miles of which had a gradient of 1 in 45½, and nine miles of 1 in 50, both worked by locomotive power, at a speed of from fifteen to twenty miles per hour for passenger trains, and from ten to

fifteen miles per hour for goods trains. The curves were frequently 600 feet radius. Although it was one of the main thoroughfares of American commerce, no extra provision was made for working these inclines, beyond increasing the number of the engines. The engines had eight wheels, all coupled, the diameter of the cylinders being 17 inches, the length of the stroke 2 feet, and the diameter of the wheels 4½ feet. The engines weighed 24 tons each, and the tenders 13 tons each.

In 1852 difficulties were encountered at two different tunnels, which rendered temporary inclines necessary, in order to accomplish the passage of the trains. This system was frequently adopted when it was required to surmount hills where the tunnels were incomplete, in order to enable the iron and other materials for the permanent way to be delivered along the line. There was a maximum gradient over the Kingwood tunnel of 1 in 10, and this incline was in operation for several months, the iron and other materials for upwards of forty miles of line, and the United States Mails, having been conveyed over it by locomotive power. The same engine that was used on the other parts of the line was employed, and it drew a loaded car weighing 13 tons, and a tender weighing 12 tons, or a total weight of 25 tons, at the speed of 8 to 10 miles per hour. Over the Board Tree tunnel there was a series of zig-zag inclines, on which the upward motion of the train was alternately reversed, the engine at one time pulling, and at another pushing the cars. There were three of these inclines on the Eastern, and five on the Western slope of the hill. The total length was nearly two miles and one-third, and the gradients varied from 1 in 18 to 1 in 15½, with a minimum radius of curvature of 300 feet. The ordinary freight consisted of two loaded cars, weighing, together with the tender, 37 tons. Mr. Latrobe, the chief engineer of the line, said, in his report for 1853, that as many as fifty cars, containing 400 tons, and two passenger trains, had been taken over this hill in a day by four first-class locomotives; and that, during five months, there had been no accident involving more than a trifling detention. These two inclines, although unprovided with engines especially adapted for the purpose, fully demonstrated the feasibility of traversing gradients, altogether unprecedented, by the locomotive alone. The experience gained in working them not only established the fact, that a rise of 300 feet per mile, and curves of 300 feet radius, could be worked with comparative facility, but seemed to point also to a limiting gradient, beyond which it was impossible for the locomotive to go, with any useful effect, even for a temporary purpose.

Steep gradients and sharp curves had since been adopted on the Virginia Central Railroad, on a more extended scale, and had been in successful operation for upwards of four years. The Mountain Top incline on this road crossed the Blue Ridge Mountains, at Rock Fish Gap, in Virginia. This incline was fully described at p. 245 of the 66th vol. of the *Mechanics' Magazine*, No. 1753.

The Author believed that the resistance of the curves had been underrated in America. On the Mountain Top incline it was proved that the resistance of the curve exceeded 25½ lbs. per ton of engine and train. Mr. Latrobe had calculated that the resistance to traction, on a level, was doubled by a curve of 400 feet radius; and he assumed 13 lbs. per ton as the additional friction of a train, on a curve of 300 feet radius, whence the additional friction of the engine, due to such a curve, must have exceeded 49 lbs. per ton of its own weight. Two expedients had been resorted to for diminishing this friction. On the Baltimore and Ohio incline, for a speed of ten miles per hour, the outer rail had been gradually raised, on a curve of 300 feet radius, from 2 inches, the height given by the ordinary formula, to 9 inches. On the Mountain Top Track inclines, for a speed of 8 miles per hour, the outer rail had an elevation of 6½ inches; and a sponge, saturated with oil, was kept in contact with the flanges of the two forward wheels of each engine. These expedients had so far reduced the friction on the latter road, as to cause no perceptible diminution of speed on leaving a straight portion of the track, with a gradient of 296 feet per mile, and entering a curve of a radius of 300 feet, having a gradient of 238 feet per mile.

The Virginia Central Company had also constructed a shorter incline, about 100 miles further west, which was one mile and a-half in length, with gradients varying from 250 feet to 300 feet per mile, and curves of a minimum radius of 400 feet. Over this incline, which had been in successful operation for two years, the common freight engines, on eight wheels, four of which were coupled, giving 16 tons for adhesion, had taken a load of 36 tons, at a speed of five miles per hour.

The ordinary performances of the engines on the Mountain Top Track showed an exertion of 181½ horse power, including the engine in the load, or 118 horse power not including the engine; giving, in the latter case, 4·8 horse power per ton of motor, the resistance due to the speed and the gradient being 121·64 pounds per ton.

On one or two occasions, on the incline of 1 in 10, on the Baltimore and Ohio line, the weight of the engine being four and three-quarter times the resistance of gravity and the friction of the load, when the rails were very greasy, the engine and train slid backwards with locked wheels, from near the top to the bottom of this incline, without damage. The wheels of these engines had chilled tyres, a circumstance which considerably decreased their adhesion. The engines on the Mountain Top Track, with an ordinary train, exercised an adhesive power of one-sixth of their weight, and this could always be maintained, in the severest weather, by the use of a fine clean sand.

In conclusion the Author remarked, that there were probably few mountain passes that could not be overcome by the introduction of gradients of 1 in 17, and experience had satisfactorily proved, that the locomotive could draw a load nearly double its own weight up such a gradient, at a speed of eight miles per hour. The working of the Mountain Top Track furnished additional evidence to that already gained from other sources, of the superiority of light engines with light loads, over heavy engines with heavy loads.

A FRENCHMAN'S OPINION OF LONDON AND ITS REQUIREMENTS.

It is tolerably well known that Paris is a good deal indebted to Monsieur Victor Horeau for the basis and principle upon which most of its recent improvements have been carried out, and more particularly for those important considerations which have influenced the sanitary progress of that city. It would seem that Monsieur Horeau would do the same kindly offices for his neighbours, that gentleman having prepared enormous plans and sectional details to show that he is not only in earnest in his desires, but that he is willing to challenge the hard cuffs of criticism or the less-to-be-endured indifference of those he would awaken. Monsieur Horeau urges that the purification of the Thames is bound up with a number of other questions so intimately interwoven with it that, to consider any one without the others, is to rob unity of its charm, and to break the image of "Solidarity" into fragments. The questions he insists upon, as a whole, are,—"The Sewers, the Embankments of the Thames, Public Stores, Steamboats, the Transit of Goods by Land and Water, the General Traffic, Railways and Railway Stations, Old and New Edifices, and the Public and Private Services."

His plan for the purification of the Thames is by "iron rivulets enclosed in an annular cylinder," formed into certain lengths, according to the facilities afforded for such purposes upon the banks of the Thames; these cylinders to be supported upon openings or arches leading to the wharves, &c. He takes the Thames at 600 feet wide at Chelsea, and 800 feet between the London and the Commercial Docks. Throughout the whole of this length he would apply these cylinders, making the river one uniform width throughout, thus increasing its scour, its current, and its general usefulness. A part of the ground recovered from the river he appropriates to canals between the wharves and the proposed embankment, such canals to be flushed or otherwise at pleasure. The amount of ground thus recovered is very great, and he lays this out in his plans as though his pencil were the wand of an enchanter. Thus he would give Somerset-house a garden on the river side, and a new entrance on the south-east. It is clear Monsieur Horeau does not know there was but now an entrance in the new wing, which has been shut up *because* it became a thoroughfare. He would enlarge the Temple towards the Thames, and give the Benchers a noble edifice, to overlook its renovated waters. But for this advantage he would have them give some bits and angles of their property, to permit of the isolation of the legal boundaries by two new streets. At the river end of each of these streets he would build a travellers' hotel and public baths, with the purified waters running through the latter. On the ground wrested from the Thames, between the Houses of Parliament and Somerset-house, he erects the Government offices, and he adds a handsome Boulevard from the Houses of Parliament to the Penitentiary. The latter building appears to raise his ire, for he removes it *sans* ceremony "anywhere." But opposite its site he places a "Preventive Reformatory with Bibliothecary, Public Lectures, and Professional Schools for Girls and Boys." Then waving his wand, he says, "Thus, then, you might have a line of edifices six or seven miles in length, decorating the providential river which unites London with all the world."

But let us see what our French Vitruvius would do with our bridges. The present bridges reduced in length by the embankments on either side of the river he would strengthen by angular abutments, and thereon establish staircases and slopes to facilitate their access from the embankments, from the omnibus, boats, and the under quays. London Bridge should have its footpaths enlarged by corbals, and the carriage-way enlarged for six instead of four carriages. Two iron arched pass rails, corresponding to the footpaths of the embankment should allow the pedestrian "to cross fairly over this dangerous carriage current." He would throw open the toll bridges

by erecting shops with covered galleries in the enlarged footpaths. He suggests several new bridges—all of iron, which he would have constructed of one span only, the narrowed channel permitting readily of this. These bridges are named upon his plans:—"Tower Bridge, for traffic and railway; St. Paul's Bridge; Strand Bridge; Civilization Bridge, near to Hungerford; New Westminster Bridge; Lambeth; Pimlico and Union Bridges; the three latter between Westminster and Battersea."

Hungerford-bridge — which M. Victor Horeau says is no bridge at all—he takes up bodily and places between Westminster and Vauxhall. Nor will he let the new Westminster-bridge alone, but places it still more eastward of the Houses of Parliament, for this sensible reason that in its present position it depresses and weighs down the Houses of Parliament.

Having made bridges, nothing could be more suggestive to the fluent pencil of M. Horeau than to give us streets which should spring from them in all directions. These, he says—and we can almost fancy we hear the long-drawn sigh of this enthusiastic and philosophical master—"are for after times."

But M. Victor Horeau is by no means daunted with the nut he thus throws into the lap of posterity to crack. He would give us "A Grand Central and General Terminus to all the Railways," opposite Charing-cross and the Civilization-bridge—the new street from the one to the other to pass through the Northumberland mansion! And it would be strange indeed if he did not have "a shy" at "the finest site in Europe." "Instead of the ugly National Gallery is represented a new edifice, to group the civilization societies existing everywhere in London, with wash and bathrooms in the basement, a commercial gallery outside, and exhibition halls." The rents to be paid by these several societies, &c., he anticipates would fully pay for the building.

Surely M. Victor Horeau is at length satisfied. Will he not throw his T-square aside and let the tired legs of his compasses rest for a while? Not he. But in the name of treason what is he after now! By all that's believable he has cut off a slice of Buckingham-garden as he would threeha'porth of cheese! But, conscious that he has purloined "what isn't his'n," he would screen his iniquity by giving "to the vulgar habitation of Buckingham-palace a new outside dress in accordance with modern arts and worthy the residence of the Queen —of the woman who, as the epitome of public liberty, stands in the foremost and highest ranks of civilization." Bravo, Monsieur! A Frenchman cannot commit a trespass without paying a compliment.

We have not yet done with M. Horeau, nor M. Horeau with us, but we are fairly out of breath and must wait awhile—the more need, as we see the magician of the metropolis is about to swing us round London by bits of *chemin de fer* connecting the existing railways.

It may be thought we have treated this subject in a tone approaching somewhat to levity. This is far from our wish, for in justice to truth and to M. Horeau, we must say, he has in his suggestions the precedent of Paris and other cities to go upon, in which, under an Edile Society, improvements which have served to embellish those Metropolii, and to give employment to thousands in the arts, in commerce, and the people generally have rewarded the Government — in a word, have amply repaid themselves. What is wanted is system, under the guidance of judgment, wisdom, and good taste.

MECHANICAL AND DECORATIVE ART.

If, as we have had philosophers tell us, there is no such thing as beauty, we must include taste in the things that are not. But, as we have an equal right to our own opinion, we shall continue to deal with the appreciation of the beautiful as much more than a mere idea or unaccountable prejudice somehow or other engendered in the brain. With this confession in favour of tastes and prejudices, and the strong conviction that our fellow-men continue to entertain similar conclusions, it is scarcely worth while to seek deeper for the causes which thus operate upon our minds. It has been remarked, "that in matters of science we marvel and can believe almost anything; but in our tastes and feelings we naturally and by an undoubted instinct shrink from the touch of an innovator as we would shun the heel of a donkey."

We have received more than one kick of this kind of late! Colour, which is as capable of harmony in the hands of the chromatic musician as music itself, has been screeching and continues to screech in most fearful disorder in our public halls, and has thrust its offensive discord yet more recently into our streets. While this outrage upon the Grammar of Art was confined within the walls of public dwellings there was little complaint to make. The owner "pays his money and takes his choice," if a choice is even assigned to the luckless wight who gets his interior bedaubed with red, blue, and yellow. The "Quarterly," if we mistake not, some while since made an attempt to arrest the progress of this national art-disgrace, and told us that the

illiterate polychromes, if not checked, would think themselves entitled to perambulate the world with their three pots of colour beneath their arms and bedaub every man's door-post; and if the whole offended neighbourhood should rush out to upset their pots and brushes they would laugh in their faces and demand, in the name of Art, payment for their plasterings. A great writer further observes: "Barbarism never actually dies. It is an ill weed, hard entirely to eradicate, and is ready to spring up in the most cultivated soils." But surely it can be checked. The Scarifier—in the embodiment of the pen—can occasionally pass over the ground and through the rows of the useful plant, and wisely discriminate as to what is legitimately occupying the soil! But if there is to exist no more taste and ability than that which fills a hall for music with negative colour, and a bazaar for the sale of coloured goods with the brightest blues, reds, &c., in the name of all that is rational let us shut up our Schools of Art and persuade the great masters to throw their palettes out of their studio windows!

But luckily all is not so full of fog as this introduction would intimate. There is light in places, and our attention has been particularly directed to awakening symptoms of a national perception in favour of art and for the tasteful refinement of our domestic institutions. A vigorous movement with regard to decorative architecture in our private and public buildings, is what is really wanted, and, although we cannot agree with some of our contemporaries in ascribing the merits of this wholesome stir wholly to Mr. Sang's return from his lengthened sojourn amongst the art treasures of Italy, Germany, and France, we are in a position to know and to admit that the most wealthy encouragers of genius in this country have hailed with no little enthusiasm the presence of one who left an ineffaceable mark in the revival of "intellectual decorative art" in England some ten or twelve years ago, and are taking unmistakably wise steps in the right direction.

The drawings for important works about to be executed by this gentleman bear the impress of originality and inventive power, and the improvements in the latter productions, compared with his earlier essays, have afforded the architectural profession as well as ourselves considerable gratification. A strictly severe architectural treatment is their chief characteristic, and this appears to defy the most fastidious criticism. A well-proportioned distribution of parts, with a freedom of hand and exquisite finish of detail, are superadded, and, as the *ensemble* is combined with glorious colouring under discreet control, and the charm of harmony and playfulness of form, the frivolous mixtures of style and meretricious productions of mediocrity which have been palmed off upon the aristocracy and wealthy as "fashionable" of late, become yet more glaring instances of ill-directed taste.

In France His Majesty the Emperor Napoleon, and in Germany King Louis, of Bavaria, have set a lasting and powerful example to all Europe for the improvement of the taste of nations; and events in these countries have fully borne out the principles laid down in England by Mr. Sang. Our object is not, however, to direct attention personally to Mr. Sang—for our own parts we wish we could say there were fifty like him—but earnestly to appeal to those who can afford to surround themselves with objects at once creditable to the refined feelings of gentlemen of well-tutored artistic minds—objects gratifying to every beholder not absolutely void of the appreciation of the beautiful. We urge them to lend an ear to undoubted facts, and, instead of merely consulting in the arrangements of their domestic comforts and their dwellings the mercantile tradesman, however respectable he may be, and to whom they so willingly offer their hundreds and thousands for the common-place and the changeable fashion of only one season, henceforth appeal to the creative mind of the artist or architect of experience, and thus insure the respect of posterity for their own taste, and receive during their existence a pleasurable equivalent for their money.

We hail the powerful stimulus in favour of art and artists with the greater pleasure, as it happily occurs at a time, it is to be hoped, when the prospect of undisturbed prosperity and peace will enable the nation to indulge in that most laudable pursuit, in which, we are sorry to be obliged to be confess, thanks to old Puritan notions, we have been left behind by most of our continental neighbours.

THE ATLANTIC CABLE.—We are informed, in reference to a paragraph under the above heading in our impression of last week, that Sir Charles Bright's engagement as Engineer-in-Chief to the Atlantic Telegraph Company terminated on the 5th of August, when the submersion of the cable was completed; and that his connexion with the Company in an official capacity ceased at that date.

THE USE OF THE WORD "PATENT."

An important question respecting the use of the word "Patent" was settled in the Court of Exchequer on the 23rd ult. Counsel the most eminent for their practice in connexion with patent law have for many years differed in opinion respecting it, and even the judges have not all been able to agree upon it. The effect of the judgment appears to be that the section of the Act hereafter referred to amounts to but little more than a dead letter. The following is a report of the trial:—

COURT OF EXCHEQUER, Nov. 23.

(*Sittings in Banco, before the* Lord Chief Baron, *Mr. Baron* Bramwell, *Mr. Baron* Watson, *and Mr. Baron* Channell.)

MYERS AND ANOTHER V. BAKER AND ANOTHER.

This case was tried before the Lord Chief Justice of the Common Pleas at the last assizes at Warwick, and was a *qui tam* action for penalties under the 5th and 6th of William IV., chap. 83, section 7, which provides that if any person shall mark upon anything used or sold by him, for which he has not obtained letters patent, any imitation of the name of any other person who has obtained letters patent for such thing, without leave in writing of such patentee or his assigns, or if any person shall upon such thing (not having been purchased from under such patentee, or not having had the license or consent in writing of such patentee or his assigns) mark the word "patent," the words "letters patent," or any words of like import, "with a view of imitating or counterfeiting the stamp, mark, or other device of the patentee, or shall in any other manner imitate or counterfeit the stamp, or mark, or other device of the patentee, he shall for every such offence be liable to a penalty of £50;" provided always, "that nothing herein contained shall be construed to extend to subject any person to any penalty in respect of stamping or in any way marking the word 'patent,' when any thing made for the sale, making, or vending of which a patent before obtained shall have expired."

The declaration, which contained four counts, was framed under this section of the Act. The defendants, among other pleas, pleaded "that the supposed invention was not any manner of new manufacture." To this plea there was a demurrer which was argued on the 14th of Jan. last by Mr. Montague Smith and Mr. Norman (who replied) for the plaintiffs, and Mr. Hugh Hill (now Mr. Justice Hill), with whom was Mr. Hindmarch, for the defendants. The Court, having taken time to consider the arguments, this morning delivered judgment to the effect that the plea was a bad one, and that it was no answer to an action for penalties under this section of the Act of Parliament that the patent could not be sustained.

The plaintiffs and defendants are both pen manufacturers at Birmingham, and the former were patentees of a pen known as "Myers and Son, Patent Galvanized Pen," and also of a patent penholder, upon which was stamped "M. Myers and Son, Patent Elastic Brevetè." The defendants were charged in the declaration with having made a colourable imitation of both pen and penholder, the former being marked "K. and G. Patent Galvanised Pen," and the latter bearing a double mark, "K. and G. Patentic Elastic," and "K. and G. Patent Elastique." The first lot of pens and penholders made by the defendants were manufactured in pursuance of an order from a firm in Germany who communicated the stamp they wished to have upon them. At the trial the learned Chief Justice left it to the jury to say whether the marks had been put on by the defendants with the view of imitating or counterfeiting the stamp or mark of the plaintiffs. The jury found there was no such intention, and the verdict was entered for them accordingly. A rule was obtained by Mr. Macauley some days ago for a new trial, on the ground that the Chief Justice ought to have directed the jury that the offence charged in the declaration was complete on proof that the word "patent" was stamped by the defendants on an article sold by them, and for which the plaintiffs had obtained letters patent, and that his Lordship ought to have submitted to the jury whether, in point of fact, the marks upon the articles sold by the defendants were such as to lead the public to suppose that they were the plaintiffs' patented articles.

Mr. Serjeant Hayes and Mr. Alfred Wills now showed cause against the rule; Mr. Mellor, Q.C., and Mr. Field supported it.

It was contended for the defendants, that as the action was a penal one the *intention* of the parties was of the first importance. The fraudulent intention with which a trade-mark was counterfeited was the essence of the offence, the present Act, being penal, ought not to be construed beyond the strict letter of it.

Mr. Serjeant Hayes.—It was proved to be the custom at Birmingham for the trade to put any stamp on the pens they manufactured that they were requested by the dealers to put.

For the plaintiffs it was argued that the offence intended to be prevented was not only one against the patentee, but also against the Crown and the public. That, if it was an imitation using the word

"patent," it must be taken to have been used with that intent, and that the actual intent was no more material than the intention of a person infringing a patent.

The Lord Chief Baron said,—We are all of opinion that the rule must be discharged. The question is, whether, on reading the clause, the expression—"with a view of imitating or counterfeiting the stamp, mark, or device of the patentee," must be taken to refer to the whole or only the latter part of it. When it is read with a view to ascertain the real meaning of the legislature, we think it must be read as applying to the whole, because, otherwise, the penalty would become due under circumstances where there could be no reason for imposing it. We are, therefore, of opinion that where a man has acted with innocence of intention and without any view of imitating or counterfeiting the mark of the patentee he is not liable to penalties under this section of the Act of Parliament.

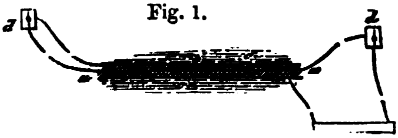
TATLOCK'S IMPROVEMENTS IN SUBMARINE TELEGRAPHS.

One of the chief difficulties to be contended with in submarine telegraphy, as our readers are aware, is the effect of the charge imparted to the insulating material by the passage of the original current through the insulated conductor. Other difficulties are matters which may be got rid of by mechanical ingenuity and by greater attention being paid to the thorough insulation of the conductor. We have, in a previous Number (Sept. 4, 1858), whilst describing Mr. Hearder's patent cable, entered fully into the subject of this charging of the gutta percha, which renders the transmission of messages extremely slow and difficult.

A method of obviating the effects of this influence has recently been provisionally protected by Mr. Tatlock, of Chester, who describes his system as follows:—

"It consists of using an insulated conductor throughout the circuit instead of (as in the method at present adopted) using the earth for the return circuit. As at present used, a submarine or underground cable represents an immense Leyden jar, in which the insulated conductor represents the inner coating of the jar, and the sea or earth the outer coating, the insulating medium acting the part of the jar itself. The current transmitted along the wire charges the insulating medium on the inside, and by induction on the outside, with opposite kinds of electricity; and, as the induced current always travels in an opposite direction to the original current, the results are, of course, very embarrassing. So long, however, as there is no communication between the oppositely-charged surfaces, no effects of the induced current would be manifested. But in the present system such a communication always exists, as will be perceived from the following sketch:—

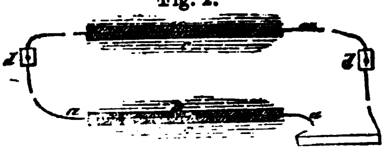
Fig. 1.



"In this sketch, *a* represents the insulated wire; *b*, the insulating medium; *c*, the earth or sea surrounding it; *d*, the galvanometer or other indicating apparatus. It will be perceived that there is a conductor from one side of the insulating medium, *b*, to the other; in fact, the same conductor for the transmission of the induced as for the original current.

"The following sketch will illustrate my improvement:—

Fig. 2.



"In the above sketch the letters refer to similar parts of the cable, &c. It will be seen that the original current travels altogether along an insulated conductor, and that there is no communication from the inside to the outside of the insulating medium, and, therefore, no effect upon the indicating apparatus takes place.

"It is well known that the mere length of the conductor would not afford any obstacle to the instantaneous transmission of signals along a line of the length of the Atlantic cable. This is practically demonstrated by the fact that the *first* signal transmitted along the cable is conveyed instantaneously, and it is only when the induced current comes into play that the signals are interfered with. The effect, therefore, of doing away with the inductive influence cannot be too highly estimated."

Mr. Tatlock's view of the matter is not, we regret to say, quite correct. There is no "induced current" in the cable resulting from the primary current; it is merely a charge of the surface of the insulating medium, and, after the primary current has passed, that charge returns into the wire and escapes at both ends, so that it cannot be said that the induced current is the reverse of the primary one. Mr. Tatlock's proposal is a resumption of the old plan of a return wire instead of an earth circuit. There is but little doubt that the present Atlantic cable will answer far better when

the Company lay down another, so as to work through both, using one to carry and the other to return; and in any multiple conductor, well insulated, this can be done to a certain extent, but not without Mr. Hearder's process of insulation. Even two cables laid side by side, insulated in the ordinary way and used as one circuit, would induce upon each other, though the mischief would be less than with the earth circuit.

NEWS FROM AUSTRALIA.

The following letter, addressed by a resident of Melbourne, Australia, to a gentleman of position in London, has been kindly handed to us for publication. It will be found to contain intelligence of much interest to inventors and others. We have not thought it necessary to abridge it, for the closing remarks, although personal, are calculated to do good suggestively.

Australian Patent Law—Importers deemed Inventors—New Mining Journal—The Gold Mines—Machinery needed—Gold Smelting — Railways — Parliamentary News—The Land Question—Personal.

"My dear Sir,—I have to acknowledge the receipt of your kind letter, with the copy of some remarks, and I thank you for your good intentions in making them public. I have made inquiries at the Chief Secretary's Office, and find they have received communications from the Home Government on the subject of sending home the list of patents granted here, and ere this you will have received the first instalment. I am happy to say that the patent business here is steadily increasing. I am working hard to bring it into notoriety, although as yet but little has been done, except with our own people. In referring to the publication, I notice that the colony is spoken of as South Australia, in the heading of the article referring to South Australian patents. The fact is, that patents are not granted in South Australia. It is a very common error that people fall into as to the geographical position of this colony. Many call this place South Australia on account of its being the most southern of the colonies; but at the time that Adelaide was called South Australia it was the southern colony, for at that time Victoria was a part and parcel of New South Wales, and all the laws of that colony were in force here; but since the separation, we have independent laws upon most subjects. Now, the laws in relation to patents are different in each colony. The law here is based upon the English—is almost the same—except that the fees are less. In New South Wales they grant letters of registration, upon petition, which are granted for fourteen years upon the deposit of specification, duplicate copies of which are required, one of which is returned, annexed to the letters of registration; the cost of this, including agency charges, is about £35 for fourteen years. In Tasmania they have no patent law; they are beginning to talk of having one. In South Australia they have no patent law, but they will grant a similar privilege by an Act of Council, a process of a similar character to a private bill. The cost of this, if not opposed, is about £60; but there are very few applications, as you may suppose.

"You will remember in my last, that I alluded to the agitation that was going on on the point of who was the first inventor. Well, the case that was before the Court has not been decided. The defendants in that action brought forward a party who swore that he had publicly used the invention before the date of the patent. Of course, in the face of that the injunction was not granted; but the bill was kept on the file for six months, leaving the plaintiff to bring his action; but the invention does not seem to justify the party in proceeding, so that we shall not get the opinion of the Court upon the point of law. But a case was recently submitted to the Government here, who have given an opinion that the first introducer is deemed the inventor. Now, this is a point that I am very anxious should be prominently brought under the notice of the English inventors, because the effect of it is just this, that the first person who brings an invention into this country can protect it by a patent, although he is but an importer. It therefore behoves the inventor, if he intends to protect himself in these colonies, to do so at the time he enrols his specification at home; he can always secure it in the first instance, if he will. It should be borne in mind, that an invention patented here shuts out the importation of that article (supposing it to be an article), and the effect of it really is this, that an English patentee would be shut out from sending his goods here, should any one else have secured the patent. I can hardly think that with many inventions they would run this risk, when it can be avoided by the payment of £15, which would be the whole expense, including agency.

"I have forwarded to you the first number of a new mining journal, in which you will see an article upon patents and inventions, in which this subject is fully entered upon; and I think you will say that the paper altogether is a very creditable production. The only fear that I have is, its cost will be too great; but yet, from the general pro-

mises of support, I am in hopes that it will be kept up. The mining interest is a large interest here, and it will be hard indeed if it cannot support its own organ.

"The great subject occupying the attention of all interested in mining now is, What are the Government going to do with leases? The uncertainty upon that subject has kept, and is keeping, capital from being invested in the golds. What is sought for is, fixity of tenure. Without that the capitalists will not embark their capital, and, without capital is introduced into the gold fields, I much fear that the yield of gold will fall off—I mean from the older gold fields—as they have been so thoroughly worked over by the individual digger, and finished by the Chinese, as to leave nothing now to be done but to work them up again by the aid of machinery. Again, in working the quartz reefs they are beginning to find out that they run down to depths that were little thought of. At Bendigo they are down as far as 300 feet, and with every appearance of going as deep again. This by the old system of working is impracticable, since machinery becomes necessary, and that of the most costly character. The quartz reefs of this colony are, I verily believe, inexhaustible; at the same time there are thousands, I may say millions, of tons which will not pay for the crushing under the present circumstances, but which by good machinery can be crushed for 15*s.* or 20*s.* per ton. They are now charging £2 15*s.*, so that no quartz less than 1 oz. to the ton can be wrought. Any invention that will facilitate obtaining the gold from the quartz will be highly valuable. You will see by the paper that I sent you, that we are doing a little with smelting. Whether it is yet practical we shall soon see; if it is, a great revolution will be effected, but I do not venture to give an opinion upon it, but if there is anything in it, the parties now have an opportunity of bringing it forward.

"Our railways are proceeding very rapidly. We have at the present time four lines in progress—two by the Government, and two by private companies; the one from Melbourne to Bendigo is advancing, as well as the one from Geelong to Ballarat; the other two are short lines for the suburbs. The dividends paid by the only one really at work are very encouraging, and would, I think, cause a little envy amongst some of your railway shareholders—14 per cent. *bonâ-fide* dividend, with a large reserve. This is the Hobson's Bay line, with the branch to St. Kilda.

"Our political world is very quiet. Next month the Parliament meet, when they will be occupied in passing the Estimates and the Reform Bill, after which the Parliament will be dissolved, and a new House elected, when the great subject of the day is to be settled. The land question is looked upon as the panacea of all the evils both imaginary and real. I don't take much interest in politics. To tell you the truth, my mind is so constantly on the stretch to find the ways and means. A wife and seven children to uphold in any position in Australia require the untiring energies of a man. I assure you, mine is a life of mental toil. Besides my business, I am writing now for two papers, so that you may suppose I have not much time to spare. But I care not, so long as I can get the needful. I strive to make a pleasure of it; I believe that is the best way to get through any position, although a painful one.

"And now I must bring this letter to a close. I am afraid that you will think that I am a sad prosy fellow; but 16,000 miles is a long way off, and I fancy that a short letter is always read with this conclusion, 'What a short letter for so long a distance!' If it is a punishment to you to have to read so much, I hope you will pay me off in my own coin. In the meantime believe me yours sincerely."

Curiosities of Science, Past and Present. A Book for Old and Young. By John Timbs, F.S.A. London: Kent and Co., Fleet-street, 1858.

Mr. Timbs, the Editor of the "Arcana of Science," and the "Year Book of Facts," has been so careful and constant an observer of the facts of modern science, that we know of no man so well qualified as himself to compile a volume of scientific curiosities; and the volume before us fully justifies our confidence in him. It is one of his excellent summaries of "Things not Generally Known Familiarly Explained," and is to be followed by another of similar character. The present volume illustrates the facts of Astronomy, Meteorology, Geology, Palæontology, Physical Geography, Sound, Light, Heat, Magnetism, and Electricity; the coming one will include branches of Natural and Experimental Science not here presented. Mr. Timbs displays rare good sense and exemplary candour in quoting his facts without alteration from the best authorities, and acknowledging their authorship unreservedly. His book is consequently a volume of marvels, all credible—all, indeed, undoubted. We cordially wish him health and strength to continue his labour in the glorious and boundless fields of science, and we recommend our readers to profit by the harvest which he is reaping for them.

A Guide to Typography, Literary and Practical; or, the Printer's Handbook, and the Author's Vade Mecum. By HENRY BEADNELL, Printer. No. 1. London: F. Bowering, 211, Blackfriars-road; and at 3, Raquet-court, Fleet-street.

THIS is the first number of a work which is to be completed in about twelve numbers, and promises to be fully worthy of its comprehensive title. We have examined the number before us with much care, and find throughout it evidences of very considerable skill and culture on the part of the author. If the merit of this first instalment is sustained to the end, Mr. Beadnell's volume will be the most valuable treatise on the printer's art within the reach of the multitude.

THE AMERICAN CIGAR STEAMSHIP.

THE designers of the American cigar steamship described in our last Number, and so beautifully illustrated in the *Illustrated London News* of Saturday, Nov. 27, have overlooked a most important fact, viz., that the propelling wheel used by them will drive the ship sideways as well as ahead, and thus give her an oblique motion like that of a crab. The reason of this is obvious. Each blade of an ordinary screw propeller exerts what may be considered as two forces, one tending to advance the ship, and the other to move her stern laterally; but, as the whole screw is submerged, the transverse forces of the two blades neutralize each other, and the propeller is therefore effective in advancing the ship only. In the cigar vessel, however, the propeller is but half-submerged, and the lateral force which each blade exerts as it passes under the vessel is wholly unbalanced, and free to produce its full effect in moving her sideways. It may be supposed by some that the employment of two wheels, side by side, and moving in opposite directions, would remove the difficulty. But it would not. They would have the effect of turning the vessel round about a point situated between the two wheels. The only efficacious method of propelling the vessel forward, and forward only, by such means, is that of employing three wheels, the middle wheel having a propelling surface equal to that of the other two, and turning in a direction opposite to them. The transverse forces of three wheels thus arranged would neutralize each other, and the vessel would be propelled ahead as the designers vainly expect her to be with the single wheel.

SHIPS' PUMPS.

To the Editors of the Mechanics' Magazine.

GENTLEMEN, — Your correspondent "J.S.H." must be a most extraordinary person. He commenced his share of the "pump controversy" by depreciating and ridiculing me as much as he possibly could, and now he turns round and says it is I who have acted thus towards him. I do not think he can point out one intemperate sentence, letting alone an abusive one, in all my letters.

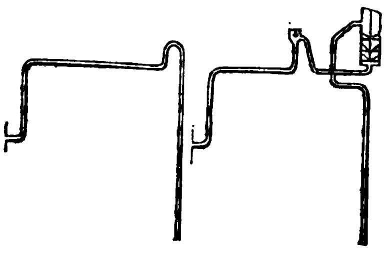
With regard to the long quotations from the very able work of Venturi, I beg to inform you that if "J. S. H." has raked it up for my especial edification he has wasted his time and your space, as I had found all that out by actual experiments long before I heard of Venturi; but, as it may be information to many of your readers, I have no objection to its being brought in, however irrelevant it may be to the subject. I say irrelevant, because where anything approaching the diagram, page 469, No. 1840, of your Magazine, can be found in my pump I am at a loss to see, unless it was the 3½-in. corrugated leather suction hose that I fitted temporarily to my pump, and was foolish enough to allow to remain on after Mr. Stone had fitted Downton's pump with 4-in. copper suction and a 4-in. delivery; and this was the condition of the pumps on the 6th of August last,—my pump 25 per cent. larger capacity, with flexible suction hose 33 per cent. smaller in area, and kicking about with every stroke of the pump, and Downton's with copper suction, and yet (although the pumps were worked with the minimum number of men) the gain was only one and one-tenth per cent., as given by the dockyard authorities, after taking sections of the vessel and calculating the quantity of water thrown by each pump. Upon every other occasion, when fitted with equal suctions, the gain was invariably in my favour—upon an average 25 per cent. at least, whilst upon all other points there was scarcely any comparison at all. It is quite true that Mr. Stone gave it out that Downton's pump gained 85 per cent., but how did he make it appear? Why, by saying that my pump was 60 per cent. larger capacity, and he then gave the area of the deck of the vessel instead of the area at the surface of the water 2 ft. from the top of the keels. He also forgot to deduct the space occupied by six tanks, some pieces of timber, &c., and he then went into a calculation to prove that ⅞ of an inch (the quantity gained the first trial on that day) was 25 per cent. gain (for calculation, see his letter). He also says, "Had there been only 2 in. instead of 2 ft., it stands

to reason it would be the same, viz., $\frac{7}{8}$ in., with this small difference, as $\frac{7}{8}$ in. is nearly half 2 in., it would be 50 per cent." In fact, the whole calculation put me in mind of the problem in the farce of the "Irish Tutor," where the length, breadth, and depth of the ship are given to find the name of the captain. But, Gentlemen, as there were two trials on that day, the men being shifted over, and as the second only gave $\frac{1}{8}$ in., I suppose the authorities were justified in taking the average of the two trials. Again, as upon one trial on the 19th of June a tank (never mind the size at present) was filled by my pump with 82 revolutions and by Downton's with 106—this was pumping rather slowly—and as upon the 21st three tanks were filled by my pump with 240 revolutions, and by Downton's with 308, hence, the 80 and 102·66 revolutions (and I am very much out in my calculation if "J. S. H." is the man to throw overboard ·66 in his calculations, however much he may jeer at it being noticed by me) and I think it is quite evident that 25 per cent. is about the right difference of capacity. As regards the other part, I think few of your readers will be likely to take the calculation of a person who does not know that the area of a vessel is different at 2 in. and 2 ft. from her bottom to what it is at her deck; or, in other words, measures a vessel as if it were a box parallel all ways, in preference to the calculations of Mr. Peake, than whom, as his published works show, few know better how to measure a vessel or tell the area of any given section. Your correspondent also talks about dipping fingers into water to see how easy it moves. He appears to forget that it is equally easy to dip your pen into ink, and make assertions anonymously which it would be hard to prove. He also talks of "small-beer interlopers." This savours much of the tap room, and could scarcely have been produced by anything weaker than *Hollands*, with which he appears to have screwed his courage up to the point denominated *Dutch*, or he would never have dared to offer to meet me six to twelve. Why, Gentlemen, as I proved on board H.M.S. *Fisgard* on the 15th October last year, in the presence of Charles Atherton, Esq., Chief Engineer of Her Majesty's Dockyard, Woolwich; James Peake, Esq., Assistant Master Shipwright; J. Large, Esq., the present Assistant Surveyor of the Navy; Mr. Mugford, Master of the *Fisgard;* Mr. Stone, and others, that with an equal number of men and the same branch and jet pipe, my pump threw the water over the topsail yard and Downton's only over the foreyard, I think I should be quite safe in meeting him equal-handed. His coarse nonsense about pumping on each other I really must refuse to notice.

But, Gentlemen, it appears to me that "J. S. H." is begging the question entirely; for, after all, it is not so much a question whether my pump has certain bends and angles, but whether mine or Downton's has the most; not so much whether the water is bruised in passing through mine, but whether it is not bruised equally as much or more in Downton's, with its two buckets up and one down, and two buckets down and one up, one bucket lifting the water up and two knocking it down, two lifting it up and one knocking it down, and so on alternately, until it knocks itself to pieces. Another point of great importance is simplicity of construction. Now in Downton's pump, from its peculiar motion (the cam), there is always a striking of the parts in a new pump, and of course as they wear away it gets worse and worse until the ship gets into port, when it goes to the engineers. This striking is quite evident to every person who has been in the vicinity of Downton's pump when at work, as you can hear it all over the ship, unless it be a very large one; but with my pump, you ha veonly to screw up the bolts as the brasses wear away, and you can keep it without a pump until the bearings are worn through, when a new set could be put in in a couple of hours, or less, and the pump be as good as ever. Downton's could not be repaired in as many days. Again, I have made and fitted a temporary set of valves out of a piece of board and some old convas, and had the pump at work in 35 minutes, and I have no hesitation in saying this could not be done at all with Downton's. But it is not a single feature that makes the article; it is its general properties combined, one principal one being its cost, and in this my pump is about 25 per cent. larger capacity for the same price.

Again, Gentlemen, "J.S.H." says if it was desirable that ships' pumps should be portable, nothing is easier than to make Downton's portable *by altering it.* I never said it could not be altered and made portable, but as a main pump that was portable has long been a desideratum in the service, and I was the first to produce it, it certainly cannot reduce the credit due to me that, after two years, they have found out that Downton's *can be altered and made portable.* Again, "J. S. H." says, "Who ever heard of its being wanted to turn a pump into a syphon?" Why, I could scarcely believe my senses when I read it. Did "J. S. H." never hear of spontaneous combustion at sea? Did he never hear of cargoes being on fire in the hold, as in the case of the *James Bain*, *Sarah Sands*, and

others? Did he never hear of men trying all that lay in their power to put the fire out, and, at last, being obliged to give it up, and fasten down the hatches, and await their fate? Did he never hear of people waiting even so long as three days, until the deck has been so hot that they could not stand on it? Have we not had one such case within the last three weeks—that of the *Eastern City*—which ship, with 250 souls on board, was on fire for hours and hours, those on board being rescued at the last moment? Now, as my 5½-in. pump, fitted on board Her Majesty's ship *Industry*, when converted into a syphon, ran the water from 12 to 14½, or 2½ in. in one minute, I venture to think it quite possible that, had the *Eastern City* had one of my pumps on board, the fire would have been extinguished in a very short time—a couple of hours at most—the ship saved, and, what is of still more importance, the passengers saved from many hours of the most agonizing suspense. I think I have said enough to prove the necessity for pumps that can be used as syphons. "J. S. H." also says, "If it should be, Downton's could be made in five minutes to act as a syphon down five pipes, and Roberts's only down two." Now, this is really too bad. My pump is always ready to be used as a syphon at a moment's notice, down either of two pipes. All that is necessary to do, is to turn the plug halfway over each port, and give about six strokes of the pump to exhaust the air, and then leave off, when the water instantly rushes down the pipes into the hold without going into the pump at all, but simply up one pipe, *a*, and down the other, *b*, fig. 1; and this one pipe is quite enough, for



if you had five or fifteen pipes in the hold, you have only one from the sea. But what is the fact as regards Downton's? Why, just this: if you wish to convert it into a syphon you must get a piece of suction hose fitted from the delivery nozzle of the pump to the suction plate. Now, supposing this to be kept always at hand, to use it the cap nut has to be taken off the nozzle of the pump, and also off the suction plate, and very likely the goose neck shifted; the piece of suction hose must then be screwed on to both pump and suction plate, quite air-tight, and the pump set going. The water will then have to pass through the pipe, *a*, fig. 2, to the suction-plate, where it encounters the foot valve, and first enlargement; it then passes one acute angle and three bends into the pump; there it is enlarged to five times its former volume, and has to pass three pairs of valves, two in each bucket; it then is again reduced in bulk to its former size of one-fifth, and passes another right angle along the suction pipe, round three other bends to the pipe, *b*, leading to the hold. Now, I ask you, how long it is likely the water would run with its two sharp angles, nine bends, two enlargements, one to five times its bulk, and its seven valves to check it? Why, common-sense, without Venturi's theory, says it must stop when the men cease pumping. But I cannot find a single person who ever heard of its being used as a syphon. I would also ask, how many times the cap, nuts, hose, &c., could be shifted in five minutes, particularly on a dark night? It certainly sometimes happens, that the pipe can go direct from the suction plate and save two bends, but this is seldom the case. At other times it has another bend, and the suction plate has to be raised upon a chock; on board the *Icarus*, launched a few weeks ago at Deptford, it was raised 2 feet from the deck to the under side of the plate,—a very pretty ornament, truly, a chock 2 feet diameter and 2 feet high, surmounted by a suction plate! Now, there is never any occasion for this with mine. "J. S. H." says, further, if these pipes be choked, the Downton can be made to force water down them to clear them, and Roberts's cannot. I ask him why I cannot. And I answer my own question by asserting, most distinctly, that the same means are open to me to do it that Downton's has,—viz., to put nipples and cap nuts over my suctions, and connect a piece of pipe from the nozzle to either. But I have never had to do it yet, because my pipes do not choke. Anything that enters the pipe comes up to the valves, when, if it will not pass through, we take off the air chamber and clear it. This can be done in a couple of minutes, and the pump be made all right again. But what is the case with Downton's? Just this, to prevent anything over about ½ an inch in diameter from entering, for fear of choking the valves and injuring the delicate parts, they have a strainer at the lower end of the pipes, and, on board steamvessels particularly, small

pieces of coke, coals, &c., get into the holes and stop them. Now, it will be evident, that, if the ship had three or four feet of water in her hold, there could be no clearing them from below; therefore, perhaps, just at a critical moment, when the pump is most wanted, they have to stop to force the obstruction away, but only to draw it back again directly they recommence working.

I think I have now proved that "J. S. H.'s" facts are all fallacies, and I think with him it will be quite waste of time to trace comparisons between the pumps any further. But, had he compared Downton's pump to the gilded, rickety, holiday coach of a former age, and mine to the rough and ready work-a-day locomotive, he would have been far nearer in his simile. There is one other point and I have done, and that is, the straw that the drowning "J. S. H." clings to with such pertinacity, —viz., my unfortunate error. No person can regret that more than I do; and, I ask, is it likely, when I knew that my opponents were trying to raise every interest against me, that I should have endeavoured to foist fictitious experiments upon your readers, and give, at the same time, figures in support of them that any schoolboy could have detected wrong? But, although "J. S. H." is so sharp upon me, he forgot to tell us how he magnified one-eighth into 20 *per cent., or one fourth.* These are his own words. Now, I think it is usually understood that twenty per cent. is one-fifth, but he makes it still worse in his last by stating, that, by adding 5 per cent. to it, it will make it 19; or, by adding 10 per cent., it will be 25¼. I think when he can prove this is correct, he will really have some ground for what I am told are his present pretensions as "calculator" to a department which I will not definitely mention in connection with himself.

I think I have now proved that his figures are about as much to be depended upon as his facts. But, as to the size of tanks, I was told by one of the leading men in the dockyard, that the tanks were what is termed 300-gallon tanks, and were of the dimensions given, and, my unfortunate error having caused the result to be, as nearly as possible, the same as the tanks on board the *Fisgard*, I did not check the calculation; but I pledge my word, as soon as I can get the exact size (the number of revolutions I know to be correct,—they were counted by three separate persons at different points, and afterwards compared and found alike), I will send you the result, whatever it is.

And now, having, I think, offered a sufficiently humble apology for my error, I will, with your permission, make a few finishing remarks. Throughout the whole trials I was only anxious to have a fair field. I never gave a statement to the representatives of the Press until after the official report had gone in, and then not until it had been seen by some of the authorities. But what does my rival do? Just this: the moment he got what he thought he could twist into a victory, he, in direct opposition to the wishes of the dockyard authorities, gave a very palpable misstatement to the Press, and dragged me into this controversy, that has cost me pounds, and has cost him, I expect, ten times as much for letters paid for as advertisements in the various newspapers; and, when he was quite used up himself, he gets "J. S. H.," with his great abilities, and still greater opinion of them, to come to the rescue, and try his hand to strangle my bantling. If it is the puny thing they state, why not let it die in peace? But it is evident they dread it, and so try every means to burk it. They forget the tale of Œdipus, if they ever read it. "J. S. H." complains of my calling him no gentleman. I can only repeat my opinion, and that is, that no gentleman would attack a person anonymously in the manner he has me; and further, as I have every reason to believe that I have met with letters of his under his own name, when his language is as different from his letters under his initials as filtered water is to the original ditch, I can only infer that he is ashamed of the part he has been acting, and has adapted his language to the service he has been engaged in, to prevent detection. Another line, and I have done. I am happy to say the reports have gone forward very much in my favour. One of Her Majesty's ships is already fitted, and I have no doubt others will speedily follow; and I only ask for my pumps, what they will now doubtless have—a fair trial and no favour. Thanking you for your kind indulgence in this long controversy,

I am, Gentlemen, yours, &c.,

W. Roberts.

Millwall Cable Works, Nov. 23rd, 1858.

[We are indisposed to prematurely cut short a controversy on a subject of immense importance; but, as we purpose dealing with this pump question hereafter ourselves, we shall be pleased to find our Correspondents relinquish further demands upon our space. Mr. Roberts, like most inventors, has an up-hill battle to wage, and we have, therefore, offered him every opportunity for fighting in his own way; hence the appearance of the long letter published above. We hope neither combatant will be indisposed now to await our verdict.—Eds. M. M.]

COMPOSITION FOR COATING IRON SHIPS.

To the Editors of the Mechanics' Magazine.

Gentlemen,—In your November Number you give a notice of an invention patented by me which is partly incorrect.

P. 467, you say, the grease may have "blue stone or sulphate of copper mixed with it." This is wrong; there is no material of this description used at all in the composition, full particulars of which are given in the November Number of the *Practical Mechanics' Journal*. Blue stone and sulphate of copper are known to be injurious to the bottom of ships, and I request that you will explain how you have given such a description of the invention patented by me, called McCrae's Patent Grease, and correct same in your next Number.

I am, Gentlemen, yours, &c.,

Daniel McCrae.

3, Bank-street, Greenock, Nov. 19, 1858.

[Mr. McCrae writes in a very much higher tone than is justifiable. Our notice was based upon his own specification, bearing his signature, and if that is wrong it is his own, and not our fault. We have an official copy of the specification before us, and from the opening sentences we take the following extract:—

"My said invention relates to the adaptation and use of a greasy substance as a preservative coating for ships' bottoms and other exposed surfaces. The grease employed for this purpose is of a peculiar character. What is known as 'bone grease' is preferred for the purpose, that is to say, the species of fibrine grease obtained from the cells of bones by boiling; other greases or greasy matters may, however, be employed, such as that obtainable from 'kitchen stuff;' but oils and tallows or lard are not available. This peculiar grease may have 'blue stone' or sulphate of copper mixed with it, or it may have various poisonous matters incorporated."

In reply to Mr. McCrae's spirited but unwarranted interrogation we would say, if "blue stone and sulphate of copper are known to be injurious to the bottoms of ships, we request that you (Mr. McCrae) will explain how you have given such a description of the invention patented by you." Until Mr. McCrae answers this inquiry he has no claim upon us for a reply to his too haughty question.—Eds. M. M.]

CONCUSSION FUZE FOR SPHERICAL SHELLS.

To the Editors of the Mechanics' Magazine.

Gentlemen,—As some members of our highest court of justice may, in a few months, wish to know at what time the concussion fuze for spherical shells, for some years adopted in the service, was *first* submitted to the authorities, I beg to inclose a letter from Captain Sir Thomas Hastings, R.N., which will give the necessary information. My concussion fuze is fully described in your Numbers 1810 to 1818.—*Forsan et hæc olim meminisse juvabit.*

"R. N. C., Sept. 11th, 1841.

"My Dear Sir,—The object you propose to attain by your concussion shell, is very desirable, and, if such a spherical shell can be prepared and used with safety, it will be one of the most important improvements made in gunnery for a century. If anything should bring you this way, I shall be happy to profit by your obliging offer. Believe me you need not apologize for addressing me; I cannot but respect the zeal you have showed in prosecuting your investigation into this, and more subjects connected with naval gunnery.

"I am always most sincerely yours,

"Thomas Hastings.

"To Capt. John Norton, late 34th Regt."

It will be well to publish the above letter in the *Mechanics' Magazine*, as it will *prove* that I was the originator of the concussion fuze as far back as September, 1841. It will *puzzle* even a select committee of artillery officers to say *where* was "the concussion fuze of the service" *before I successfully* tested mine, in the marshes at Woolwich, and on which the Select Committee of that time reported in 1842 so favourably, stating that it "was simple, safe, and efficacious, being well adapted for horizontal fire with high velocities."

I am, Gentlemen, yours, &c.,

J. Norton.

Rosherville, Nov. 26th.

Hall's Apparatus for Working Railway Breaks.—After the meeting at the Institution of Civil Engineers Nov. 23, a model was exhibited of an apparatus by which railway carriages were coupled together, so as to render the action of the breaks continuous throughout the train, and thus render it possible to apply three or four breaks simultaneously. This apparatus, the invention of Mr. Walter Hall, of Erith, was fully described and illustrated at page 385, of No. 1811, of the *Mechanics' Magazine*, for April 24, 1858.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

CLARK, W. S. *Improvements in grain and grass harvesting machines, and in the automatic delivery thereof of cut grain.* (A communication.) Dated Apr. 5, 1858. (No. 720.)

This cannot be described without engravings.

SMITH, J. *Improvements in the manufacture of pile fabrics.* Dated Apr. 5, 1858. (No. 722.)

The patentee produces a velvet, pile, or plush fabric with a cotton back and silk pile or plush face, without using two yarn beams, or introducing wires to enable the operative to cut open the plush or pile of the cloth. He uses cotton warp with cotton and silk weft, and only requires a two-shuttle power loom to weave it. By this plan he can produce either a plain or twilled back, the pile or plush being of silk, or silk and cotton mixed. His invention consists also of a method of designing adapted for the weaving of two back or foundation picks, one next to the other.

FOX, S., and J. CHESTERMAN. *Improvements in stays or corsets, and in the manufacture of steel employed therein, and applicable to other articles of dress.* Dated Apr. 5, 1858. (No. 724.)

The patentees make a frame for the body, with steel ribs or hoops, and rivet upright ribs where necessary to afford an easy but effective support to the body. They make steel for the stays or corsets, and other articles of dress, by corrugating a thin riband or plate, whereby they obtain great strength without increasing the weight of the steel. The invention consists also in hardening the steel by a blast furnace in which is used gas coal or coke as fuel. The steel is passed through the furnace enclosed in a tube, and in its heated state is passed through cold plates, or oil, or water, and then through acid for cleansing, and through melted tin to temper and tin it.

SARONY, O. *Improvements in producing photographic portraits.* Dated Apr. 5, 1858. (No. 725.)

This invention was described at p. 426, No. 1838.

HORNSBY, R., jun. *Improvements in ploughs.* Dated Apr. 6, 1858. (No. 731.)

The sole plate is here of wrought iron, or malleable cast iron, the hinder part being arranged for receiving a shoe or continuation by preference of cast iron or steel. The nose of the sole plate is hollow, with a spherical bearing to receive a spherical part on the lever, to the fore end of which the share is fixed. The fore part of the breast is fixed to the fore part of the sole plate, and not to the frame of the plough. The fore part of that frame enters into the hollow fore part of the sole plate, and is fixed in it. The hinder end of the lever to which the share is fixed has an adjustment up and down, and also laterally. The hinder part of the frame of the plough is fixed to the sole plate near its hinder part, where it receives a shoe or continuation as above explained. The coulter is formed by preference with two cutting edges, and at its upper end it has a rod and tang, or enters into and is fixed in a tubular stem, so that the stem may be again and again used with different coulter blades.

DAVY, D., W. BENTLEY, and J. DAVY. *Certain improvements in looms employed for weaving.* Dated Apr. 6, 1858. (No. 735.)

This applies particularly to looms with rotary shuttle-boxes, and consists, 1. Of a sliding tappet acting upon a bent pin fixed in a horizontal lever, in which lever two straight pins of different lengths are fixed, the said pins being operated upon by a Jacquard cylinder and cards of the ordinary kind. In connexion with the above lever it is proposed to employ cams of different sizes for raising or lowering the said lever at the proper time. The cams are of different sizes, to cause the shuttle-box to be as long in moving from one shuttle to the next and adjoining one as from one shuttle to the third or fourth, according to the number employed. 2. In a construction of stud wheel. Instead of fixing the pins or studs in the face of the wheel, it is proposed to make and arrange such pins so that the points thereof are kept flush with the face of the wheel, and only two of them are forced outwards at one time by inclined planes fixed to a casting behind them. These projecting pins are taken hold of by the hooked end of levers for turning the shuttle-box round. The hooked levers pull in a direct line with the pin which it is brought into contact with. 3. In connecting at will two circular shuttle-boxes, one at each end of the lathe or slay of a loom, so as to work them together as a pick and pick loom, or to work only one shuttle-box at one end as a plain or common loom. For this purpose one shuttle-box is fixed upon a long rod which can be locked into the shuttle-box at the opposite end of the lathe or slay. 4. In attaching a spring to the axis on which the horizontal lever is mounted, to enable the axis to move or give way when the shuttle-box meets with any obstruction to its turning on its axis.

SIBILLE, E. P. *A new apparatus for warming or cooling atmospheric air, water, and all liquids of a similar density to it, warming them to the degree of heat necessary for their transformation into steam.* Dated Apr. 7, 1858. (No. 740.)

This comprises, 1. An air pump, and, 2, a case with double compartments containing all the agents used.

GILBEE, W. A. *An improved machine for corking bottles.* (A communication.) Dated Apr. 7, 1858. (No. 743.)

This consists in the construction of a machine for corking bottles, in which a conical-mouthed tube or funnel is employed, through which the cork is made to pass into the neck of the bottle by means of a plunger actuated by a lever. The machine is portable, and may be fixed to a table.

ARMITAGE, W., and H. LEA. *Certain improvements in the manufacture of iron.* Dated Apr. 7, 1858. (No. 745.)

This consists in fusing together iron in combination with steel, in the blast furnace, in the refinery with the pig metal, or in the puddling furnace. See *Mechanics' Magazine*, p. 368, No. 1836, current Vol.

BAKER, G. W. *Improved signal apparatus to be applied to railways.* Dated Apr. 7, 1858. (No. 747.)

The object here is to indicate to the engine-driver or guard of a passing train, at given points along a railway, whether the line is clear ahead of the train. This is effected by erecting, say at three miles apart, signal apparatus, provided with semaphore or other signals, which are to be worked by the combined use of a descending weight and an electro-magnet.

NIMMO, W. *Improvements in the manufacture of printed woven fabrics.* Dated Apr. 7, 1858. (No. 748.)

This consists in weaving figured fabrics of a peculiar description, and printing them on one or both sides, by which better zebra and other printed fabrics are produced than heretofore. The fabrics are woven with an all over, or nearly all over, raised figure on one side, and with only a small part of the surface covered with the raised figure on the other side.

DOHERTY, J. *Improvements in buttons or dress fastenings.* Dated Apr. 7, 1858. (No. 750.)

This consists in making at the back of a button or dress fastening a tubular shank or neck having a bar (or cross piece, or pierced disc) across it, so that when the button is attached to a garment by threads passing up the tubular shank or neck, and over the bar, the edge or bottom of the shank or neck shall be pressed into close contact with the garment, the tubular shank defending the thread from wear, and receiving the wear of the button hole.

WHITWORTH, C. F. *Improvements in signal apparatus for railways.* Dated Apr. 7, 1858. (No. 751.)

These relate to means for actuating signal apparatus, by the passing of a carriage or train; also for indicating the approach of trains. The signal is acted upon (in preference) by a weight, with a tendency to indicate danger, &c., and there is a

wire leading to a windlass, by which the signal may be drawn to indicate "all clear." When thus drawn, the end of a lever arm, weighted for the purpose, rises into a recess in a sliding bar forming part of the connecting means to the signal to hold the signal in that position of "all clear." The weighted lever arm is affixed on an axis passing under the rails, and this axis has another arm rising by the side of one of the rails which forms an inclined plane for the flanges of the wheels to press on, and at such time to release the sliding bar or plate, and set the signal to danger. In connection with the setting of a distant signal to danger, the patentee applies a cam or tappet to raise a lever to act upon apparatus carried by the locomotive engine to release a striker which then, by a spring or weight, explodes detonating powder. Another part consists of an air chamber to check the violence of the motion of the parts. The patentee describes other details which need not be enumerated here.

CARTWRIGHT, J. *Improved apparatus for transmitting motive power for driving machinery.* Dated Apr. 8, 1858. (No. 754.)

This apparatus consists of brackets secured to a framing or base, and carrying shafts. The lower shaft is in immediate connection with the motive power employed, by means of a universal coupling joint, and drives the upper one at an increased velocity by a spur wheel and pinion. This upper shaft carries pulleys of different diameters, and from these pulleys driving bands pass to transmit motion to the machines or implements to be driven.

DAVIES, G. *Improvements in the manufacture of wads for ordnance.* (A communication.) Dated Apr. 8, 1858. (No. 755.)

This consists principally in the employment of alga marina, varec, wrack grass, or other analogous marine plants or sea weeds for the manufacture of wads for all kinds of ordnance. They are immersed in a solution that will render them incombustible.

TAYLOR, G. E. *Improvements in machinery for raising the pile of cloths.* Dated Apr. 8, 1858. (No. 756.)

The cloth is made up into an endless band, and, in its passage through the machine, parts of it are kept in contact with the upper surface of the raising cylinder, by two stretching rollers adjusted to the surface of the cylinder. At the upper part of the raising cylinder, and just above it, is fixed an angular bar, having a small adjustable roller on each side over which the cloth passes from one stretching roller to the other. To compensate for the lists of the cloth being longer than the other part of the cloth there are moveable parts near the ends of the bar, which can be set up so as to raise the ridge of the bar where the lists come. The cloth is moved by two sets of three rollers.

ROWLAND, G. *Improvements in the manufacture of artificial whalebone.* Dated Apr. 8, 1858. (No. 757.)

This relates to the production of an article in imitation of whalebone from horn, by softening the horn by steam, and then compressing it by rolling processes.

MOWBRAY, F. W., and J. BROADLEY. *Improvements in means or apparatus employed in weaving.* Dated April 8, 1858. (No. 758.)

These relate, 1. When weaving carpets, &c., by the use of longitudinal pile wires of the character described in the specification of letters patent granted to F. W. Mowbray, 21st May, 1855—to means for effectually insuring the crossing of the pile warps over such wires. 2. When using two shuttle-boxes at the end of the race, to means for effecting the change from one to the other. 3, 4, and 5. To means of effecting changes in the order of picking. 6. To causing Jacquard cards or surfaces to act upon pins carried by levers by pin joints, and guiding their ends correctly to the cards or pattern surfaces. 7. When using two or more shuttle-boxes to the end of the lay, capable of being changed to the one desired, or causing them to turn upon a centre or centres of motion above the box, or so that the open part of the boxes are in a curve radiating towards such axis of motion, in place of such axis of motion being below or behind the box, as has heretofore been the case. 8. When using two shuttle-boxes for change of shuttle at the end of the lay, in placing one at right angles to the other, in place of in a radial line, and the shuttle for the time out of use will be lying sideways. 9. To means for carrying back the pickers clear of rotary or other moving shuttle-boxes after each pick.

GREENWOOD, T., J. BATLEY, and J. DOCKRAY. *Improvements in machinery for carding, opening, straightening, and preparing to be spun, tow and other fibrous materials.* Dated Apr. 8, 1858. (No. 760.)

This relates to an arrangement of the parts of carding engines, whereby the material is fed on to the cylinder, and either partially or wholly carded, opened, drawn out, and straightened, without the intervention of several pairs of the intermediate rollers, known as workers and strippers.

GREENWOOD, T., and J. BATLEY. *Improvements in machinery for heckling flax and other fibrous materials.* Dated Apr. 9, 1858. (No. 762.)

This relates, 1. To a mode of mounting heckles or heckle bars on the belts, straps, sheets, or chains of sheet heckling machines, whereby the heckle joints enter the pendant stricks of fibrous material nearly at right angles to a vertical line. 2. To a mode of carrying the sheets of heckles so as to allow of two rows of turning holders passing between a pair of sheets, whereby one side of the strick of fibrous material is dressed at a time.

AGER, W. *An improvement in rice-cleaning machinery.* Dated Apr. 9, 1858. (No. 763.)

This consists in constructing the reticulated concave in the form of a right frustrum of a cone, and in employing within it a rubber of the same form, with the surface of its upper portion a brush, and its lower portion having a sheepskin covering, the entire rubber having a relative adjustment to compensate for wear, and the two portions being susceptible of a further relative adjustment to accommodate the unequal wear of the brush and sheepskin.

JACKSON, W. R. *A self-acting railway break.* Dated Apr. 9, 1858. (No. 765.)

This consists in a horizontal arrangement of the springs and working parts, and in the substitution of a double-acting compensating lever for the toggle joint used in a former invention of the patentee's.

BAYLEY, H., and J. GREAVES. *Improvements applicable to certain machines for spinning and doubling fibrous substances.* Dated Apr. 9, 1858. (No. 767.)

These relate to mechanism for facilitating the placing of cop foundation tubes on the spindles of mules,—that is, in attaching the rails in which the tubes are placed to arms centred on one of the faller shafts, so that they can be moved from a convenient position in which they are out of the way of the operating parts of the machine when at work to a position over the points of the spindles, and in a mode of constructing the rails or receptacles for the tubes by which they are readily liberated at the time required, and are caused to pass freely from the rail on to the spindles. The rails for the tubes are made in lengths equal to the space between the bolsters of the faller shafts.

TALBOT, W. *Improvements in means or apparatus to facilitate the lowering and detaching of boats from ships or vessels, which improvements are also applicable to lowering and disengaging other bodies.* Dated Apr. 9, 1858. (No. 769.)

This invention was described and illustrated at p. 419 of No. 1839.

BAUERRICHTER, H., and C. G. GOTTGETREU. *Improvements in printing in gold, silver, bronze, and other metal, on glass.* Dated Apr. 9. 1858. (No. 770.)

From a drawing on stone or zinc plate, the patentees print on a soft, thin, slightly sized pulp paper (tissue paper) with strong varnish mixed with Venetian turpentine. They lay the paper on the glass, and press it to it with a wet sponge; then go

over it with a soft roller. Then they place a number of glasses thus prepared on one another, with something heavy on the top one. After half an hour the glasses are taken up again; soft stout paper is rolled on the thin paper to absorb moisture therefrom, and they continue to roll with a soft roller until the thin paper adhering to the glass is dry, and all the lines of the drawing show through the paper. Then the thin paper is pulled off, leaving the varnish printing sticking to the glass. The glass is now covered with leaf metal, gold, silver, or bronze. The rollers are again drawn across, and the glass rubbed with the hand or soft wool to remove the metal from the other parts, then impressed by the varnish impression or design. After this, the glass presents the whole drawing in gold, silver, or other metal, and must be left to dry.

ORDISH, R. M. *Improvements in suspension-bridges and suspended girder bridges.* Dated Apr. 10, 1858. (No. 771.)

This invention was described and illustrated at p. 366 of No. 1810, Vol. 68.

LEES, A., and D. SCHOFIELD. *Improvements in the construction of carriages for certain machines used in spinning and doubling.* Dated Apr. 10, 1858. (No. 772.)

Here (in constructing the carriages of mules and doublers) light cast-iron frames connected by diagonal stay rods are placed at suitable distances apart. To these frames are fixed the bearings for the tin drum and for the faller shafts. The side-boards, with the foot-step and bolster rails and the top boards, are secured to these frames, and the back-boards fit within grooves cast in the frames. The front-boards may be held by flanges cast to the frames. The foot-steps of spindles forming part of the said carriages are cast with a flat-bottomed recess. These foot-steps are fixed in the foot-step rail, and then the hole for the spindle to work in is drilled. The bolster or collar of the spindle is made with a bead or rib round three sides of the top of the flange.

OXLEY, J. *Certain improvements in the doors and sashes of carriages.* Dated Apr. 10, 1858. (No. 776.)

This relates, 1. To the construction of elastic pads or cushions, mounted in metal frames, and protected by a metal band or cover. The pad frames may be fixed to the sash or glass frame, or the frame in which they slide. 2. To a mode of excluding dust, preventing noise, &c., in fitting and working sliding sashes, glass frames, blinds, and shutters. 3. To the hinges of doors (particularly of carriages), and consists in forming a metal socket for the bottom knuckle, between the under side of which socket and the top face of the bottom knuckle the patentee inserts a vulcanised india-rubber washer.

PARMELEE, S. T. *The manufacture of improved belting for machinery or other purposes.* Dated Apr. 10, 1858. (No. 777.)

This consists in forming belting of layers of woven material, such as cotton, linen, canvass, &c., cut into strips, and coated on both sides with india rubber, gutta percha, &c. The layers of material are then laid together, and pressed into close union, being subsequently submitted to heat and pressure.

LECORNU, F. A. *Improvements in drawing and levelling instruments.* Dated Apr. 10, 1858. (No. 778.)

This consists in an apparatus in which certain indications are given by a plumb line, and which may be used either as a drawing or levelling instrument, or applied to other geographical instruments instead of water or other levels.

ARMSTRONG, W. G. *Improvements in the means of firing or igniting explosive projectiles.* Dated Apr. 10, 1858. (No. 779.)

This invention was described and illustrated at page 393, No. 1837, Vol. 69.

MCCRAE, D. *Improvements in preserving ships' bottoms and other exposed surfaces from fouling and injury or decay.* Dated Apr. 10, 1858. (No. 781.)

See p. 544 of this Number.

ROWETT, W. *Improvements in the construction of electric telegraph cables or ropes.* Dated Apr. 10, 1858. (No. 782.)

This consists in causing electric telegraph cables to possess a semi-floating quality, by constructing such cables of Indian grass fibre, New Zealand hemp, European and American hemp, and flax, also cotton wool, coir fibre, cocoa-nut fibre, &c. It also includes the use of a solution composed of turpentine, rosin, paint, clean or coal tar, naptha, water, copperas, arsenic, aloes, bitumen, alum, bichloride of mercury, gamlier india rubber, shellac, copper soap, or other metallic soap, and brimstone, mixed and incorporated together.

MANBRE, A. *The manufacture of a colouring matter for colouring spirits, beverages, and other liquids from the sugar of potatoes, known as glucose and syrup "de fecule."* Dated Apr. 10, 1858. (No. 783.)

This colouring is made in two different ways, and for several purposes:—1. For the colouring of vinegars, wines, spirits, &c., until proof. 2. For colouring spirits above proof. The first is obtained thus:—glucose is heated up, and just before ebullition, all the floating part containing the froth, &c., should be taken out. It must be burnt until it has lost all its sweetness or flavour of sugar. Then add water by pouring it all round the vessel, but not in the middle, to avoid an explosion, and boil it afterwards as usual. If the colouring is to be solid, it should be taken out of the vessel before adding water. If, instead of taking out the froth, one pound of alum or soda for every cwt. of glucose be added with the water, the colouring will be of a superior quality. The second is obtained by proceeding as the first, the only difference consists in putting into the vessel, together with the glucose, potash, and alum or soda with the water.

RAE, J. *Improvements in the construction of iron ships.* Dated Apr. 10, 1858. (No. 784.)

This invention was described and illustrated at p. 418, No. 1838.

THIBAULT, A. C. *Improvements in the manufacture of paper-hangings, and in the machinery employed therein.* Dated Apr. 10, 1858. (No. 785.)

This consists, 1. Of a new process of imitating wood on paper-hangings, oil cloths, &c. 2. Of a sliding printing machine for printing papers, which is also applicable for printing from surfaces in relief, or of a reverse character. For imitating wood, the patentee makes use of thin sheets of wood smoothed and polished. He dips them in a bath of water or liquid fat to render them pliant, then stretches them on a slab of marble previously coated with paste or oil, and rolls the carriage over the surface after bringing down the pressing cylinder, which, passing in contact with the sheets of veneer, causes them to adhere in all parts to the table. These sheets of veneer thus prepared serve immediately as the impressing surfaces. The veins and the pores of the wood by the pressure of the plate reproduce themselves on the paper or the fabric receiving the impression. Of wood which is too tender to resist the pressure of the carriage after cutting it into veneers, he takes casts, and makes use of these casts as the printing surfaces.

BAILEY, J., E. OLDFIELD, and S. ODDY. *Improvements in machinery for driving grindstones and glazers.* Dated Apr. 12, 1858. (No. 786.)

This consists in driving grindstones and glazers by a friction plate on a driving shaft, which plate gives motion to a friction pulley on a shaft in communication with the grindstone or glazer to be driven. The friction pulley is capable of being moved laterally on the shaft, so as to be able to vary the velocity of the grindstone. The lever by which the sliding bearing is moved has a pawl taking in a segment ratchet to retain the friction pulley in or out of contact with the plate.

BICKERTON, S. *A thermo-pneumatic lubricator for oiling shafts, axles, machinery, &c.* Dated Apr. 12, 1858. (No. 787.)

Where a vessel is charged with oil, and then inverted, with the open pipe downwards, no oil will

escape; but the slightest expansion of the contents destroys the equilibrium, and a portion of the oil escapes. In this invention the lubricator is fixed with the extremity of its pipe nearly touching the shaft, and the heat engendered by the revolution of the latter expands the air and oil in the vessel, and a small quantity of oil drops upon the shaft.

KAY, T. *An improved method of producing or obtaining heat suitable for the singeing of yarns and textile fabrics, which heat is also applicable to other heating purposes.* Dated Apr. 12, 1858. (No. 789.)

This consists in combining atmospheric air with illuminating gas, and forcing the same through apertures where it is ignited, thus producing flame and heat.

RATEL, P. *A new or improved machine for depositing grain and manure.* Dated Apr. 12, 1858. (No. 791.)

This invention cannot be described without engravings.

WHITTLES, H., J. SCHOFIELD, E. LEACH, and J. LORD. *Improvements in certain parts of steam engines.* Dated Apr. 13, 1858. (No. 792.)

This consists, 1. In regulating the speed of steam engines by self-regulating cutters, giving a greater or less supply of steam to the cylinder and water to the condenser, so as to obtain uniform speed and economise steam. The cutters are similar to those described in Whittle's and Schofield's specification, dated Jan. 31st, 1857. 2. In an air and rotary pump, which both draws the water and air from the condenser, and discharges the same by the action of the under side of the piston. The invention cannot be completely described without engravings.

JOPLING, T. T. *Improvements in water-closets.* Dated Apr. 13, 1858. (No. 795.)

Here the closet is furnished with a small supply cistern for containing the measure of water to be used at each action of the closet, and the water is supplied to the cistern by a ball valve. The water escapes from the cistern by an outlet valve, and the ball valve and the outlet valve are so connected that when one is open the other must necessarily be closed. The weight of a person on the seat of the closet lifts a counterpoise, and allows the outlet valve of the cistern to close and the inlet valve to open. The cistern consequently fills with water; but when the pressure on the seat is removed, the lever returns to its former position, and the measure of water is discharged into the pan. In order by self-acting apparatus to work the valve at the bottom of the pan, the lever with which this valve is in connexion is attached to a rod which carries a float placed in the supply cistern before mentioned.

BROOMAN, R. A. *Improvements in cranes or apparatuses for raising and lowering weights.* (A communication.) Dated Apr. 13, 1858. (No. 796.)

Upon a bed provided with wheels, or not, the patentee mounts a steam engine and boiler, together with an upright frame, upon which the lower end of the jib is supported by a cross bar, so that the outer end of the jib may protrude, more or less, outwaards from the upright frame for placing a block, &c., after having been raised at any distance from the frame limited by the length of the jib. The chain passes round a windlass driven by the engine. A chain for allowing the outer end of the jib to be projected is attached thereto, and passing over a pulley in the upper part of upright frame descends down to the bed, from whence it is worked by the engine or otherwise. There are modifications included.

SCHAFER, P. and F. *Improvements in fastenings for travelling bags, portmanteaus, and other like articles.* Dated Apr. 13, 1858. (No. 797.)

This consists in fixing on the top of the outer frame of bags, portmanteaus, &c., and towards each end thereof, a spring catch to be acted upon by a spring bolt or key, and in attaching at or to corresponding parts of the inner frame a single or double hinged tongue. When the bag is closed the two tongues are brought over and made to engage in the spring catches.

NEWTON, W. E. *Improved means for operating railway brakes.* (A communication.) Dated Apr. 13, 1858. (No. 800.)

This relates to a method of applying railway brakes to the wheels by electro-magnets. The details cannot be described without engravings.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

ROBERTS, T., and J. DALE. *Improvements in the production of a substitute for oil used with pigments, and in the preparation of pigments suitable thereto.* Dated Apr. 8, 1858. (No. 761.)

The inventors use products from gas or other tar, "mineral oil," for instance, and resin, or substances analogous thereto: these they combine, and pigments may be mixed therewith.

MCCAFFERTY, R. *Preventing incrustations in steam boilers.* Dated Apr. 9, 1858. (No. 764.)

The inventor uses the black gum catechu, and employs sufficient to keep the water in the boiler about the colour of pale brandy. While that colour is maintained, incrustation will not occur, and previous accumulations will be removed.

SMITH, G. *Improvements in the manufacture of close stools, night-commodes, and water-closets.* Dated Apr. 9, 1858. (No. 766.)

This consists in introducing coarsely powdered vegetable or animal charcoal placed within a double framework of perforated zinc, wire gauze, or porous cloth. This framework is applied either to the tops, sides, and bottoms of close stools, night-commodes, and water-closets.

BIEBUYCK, J. B., and J. V. LANDUYT. *An improved process for separating the vinous and amylaceous principles from vegetable substances.* Dated Apr. 9, 1858. (No. 768.)

This relates to the manufacture of starch by vinous fermentation, and the conversion of the vinous residue into alcohol and beer. The inventors prepare a paste by working up finely ground flour, and this they leave to ferment under the ordinary atmospheric temperature. When the fermentation has sufficiently advanced they add water, stirring it from time to time, and afterwards allowing it to settle. They next draw off the liquid from the solid matters, and submit the same to distillation to drive off the more volatile portion of the spirit contained in the liquid. The remainder they apply to the manufacture of beer.

GUYOT, G. *Welding broken cast-iron pieces.* Dated Apr. 10, 1858. (No. 773.)

Molton metal is poured in a mould over the broken stump, and allowed to flow away, till the latter is brought to the melting heat. When at this point, the trenches through which the fluid metal was flowing are stopped up, and the remainder of the mould filled up with the molten metal.

NEUMANN, A. *An improved strop for sharpening razors, knives, or other edged instruments.* Dated Apr. 10, 1858. (No. 774.)

The object here is to construct an elastic strop the elasticity of which can be increased or diminished at pleasure. A strip of buff leather is distended between two projecting points, one fixed and the other moveable, and capable of adjustment by a screw.

BRUN, P. *The application of an improved blowing fan to steady or portable forges, with or without reverberatory furnaces, as well as to ventilation in general.* (A communication,) Dated Apr. 10, 1858. (No. 775.)

This invention cannot be completely described without engravings.

POUNCY, J. *Improvements in the production of photographic pictures.* Dated Apr. 10, 1858. (No. 780.)

The inventor prepares the surface by applying

over its whole surface colouring matter to form the picture, and with this a substance acted on by the light. When printing positive pictures on paper from negative pictures, he coats the surface which is to receive the picture with a composition of vegetable carbon, gum arabic, and bichromate of potash, and on this places the negative picture, and exposes it to the light in the usual way. Afterwards the surface is washed with water, which dissolves the composition at those parts only on which the light has not acted.

MICHEL, P. *An improved neckcloth or tie, means of connecting ties to collars, and an improved collar.* (A communication.) Dated Apr. 12, 1858. (No. 789.)

This neckcloth or tie is composed of a band or collar, the ends of which are brought round to the front of the neck, and terminate in two loops, by preference of metal, which loops are attached to the band or collar. The tie or band which is used to form the bow consists of a strip of silk, &c., sufficiently long to form the bow or knot; it is passed through the two loops, and the ends are brought back to tie the bow or knot.

CLARK, W. *Improvements in the pattern surfaces of cards of Jacquard apparatus.* (A communication.) Dated Apr. 12, 1858. (790.)

The object here is to render the use of paper of any kind practicable and easy, to be substituted for laced cards, and this without making any change in Jacquard apparatus. The paper is cut and pierced like the cards, and the continuous chain is formed by a series or sheath of cases of a determined number. These sheaths are composed of two pieces of paper mounted on cloths united at three edges. The fourth edge not being closed serves as an opening or inlet for introducing or withdrawing the pierced papers into or from the sheaths. These two papers or sheaths are pierced with the same numbers of holes as the roller of the Jacquard apparatus, and have besides the holes for the pendonnes or driving pegs. All the sheaths are laced or joined by small pegs glued to their exterior face. They work with the apparatus in the same manner and in the same position as the ordinary cards. In order to use the pieces of paper on which the design is pierced, they are introduced successively in proper order, one into each sheath, the holes of which correspond with those of the paper. The work is then continued as with an ordinary design.

SPILLER, T. *Exhibiting slides in the stereoscope, and preserving them from injury, to enable each slide to be conveyed to the point of view, and then after use deposit them each in its place in the box without handling or exposing the slides to the chance of being spoiled, keeping them always under cover in safety; a box 18 in. by 8 in. square will hold and exhibit nearly 1,000 slides.* Dated Apr. 13, 1858. (No. 793.)

The inventor employs a box in two compartments with a square drum on the top. Over the parting inside are placed guide lines or wires. The slides are then fixed in a chain; one end of such chain is fixed to hooks on the guide lines (which slide on them, and traverse from top to bottom in each compartment of the box), and the chain is then properly folded and laid in one compartment of the box, and the other end of the chain is carried over the drum, and fixed to the hooks on the guide lines in the other compartment of the box. By turning the drum over which this chain of views passes, the slides will be brought before the lens (which is fixed on a line with the axis of the drum) and exhibited. When done with, the drum is turned one-fourth round, and another view exhibited in the same manner, until all the pictures are brought in rotation from the full compartment, exhibited, carried into the other compartment, and folded carefully up in their place. By turning the drum the reverse way, the views repass through the stereoscope.

DEAN, G. A. H. *An improvement in stereoscope slides.* Dated Apr. 13, 1858. (No. 794.)

The figures on the slides have motion imparted to them, by first taking a stereoscopic background, and then taking figures or groupings, cut out and affixed to arms passing through passages cut through the cardboard of the slide, and carried by a shaft running at the back of the slide.

YARDIN, P. A. *Improvements in trusses.* Dated Apr. 13, 1858. (No. 798.)

These consist in dispensing with metal springs for the belts or straps of trusses; in preparing the cushions or pads so as to be elastic by spiral springs, or by inflation with air, or in elongating the pads for particular cases of hernia; and in attaching the pads when required by elastic bands.

AYSHFORD, T. B. *Certain improvements in the construction of carriages called omnibuses.* Dated Apr. 13, 1858. (No. 799.)

The inventor divides the "knife-board" into separate seats by a zig-zag rail, so that each passenger is divided from his neighbour by it, and sits in an opposite direction. In front of each seat is a small foot-board, allowing a clear gangway for passengers to pass. The front portion of the omnibus is formed by cutting off the corners, giving it an appearance similar to three sides of an octagon. Over each of the parts forming one side of the octagon is a seat, receding back from the centre seats. The whole of these seats are divided by a rail.

PROVISIONAL PROTECTIONS.

Dated July 31, 1858.

1740. C. de Bergue, of Dowgate-hill, engineer. Improvements in submarine telegraphic cables, and in machinery for paying out or laying down the same.

Dated November 2, 1858.

2437. L. Beaver, of Manchester, jeweller. An improvement in sleeve links.

2439. M. A. F. Mennons, of Paris. An improved combination for the production of voltaic electricity, and its application as a curative agent to certain parts of the human body. A communication.

2441. N. Brough, of Birmingham, machinist. Certain improvements in buttons, and in the means of attaching them to garments, which said means is also applicable for other purposes.

2443. J. Lancaster, of Belfast. A new or improved method of driving and curbing horses.

2445. A. Barclay, of Kilmarnock, engineer. Certain improvements in electric and magnetic or electro-magnetic telegraphs applicable to submarine and land communication.

2447. J. Sampson, J. Machon, and J. Bartholomew, of Sheffield. Improvements in railway carriage-brakes.

2449. N. S. Dodge, of St. Paul's Churchyard, merchant. Improvements in treating waste vulcanised india rubber. A communication.

Dated November 3, 1858.

2451. C. F. O. Glassford, of Greenwich, chemist. Improvements in the manufacture of manure from the excreta of towns.

2453. V. Blumberg, of Notting-hill, gentleman. Improvements in the construction of slate billiard-tables, which improvements are also applicable for other useful purposes.

2455. D. Fryer, T. L. C. Watt, and W. Holmes, all of Paternoster-row. Improvements in tanning hides and skins.

2457. P. A. Mawdsley, of Seacombe, Chester, smalt manufacturer. The use or application of a certain substance or substances in the manufacture, stiffening, or sizing of paper.

2459. F. B. Busse, of Carlton-terrace, Sydenham, gentleman. Improvements in breech-loading fire-arms. A communication from T. Knauth, of Leipsic.

Dated November 4, 1858.

2461. J. Oxley, of Camden-town. Improvements in carriages and wheel vehicles.

2463. G. P. Evelyn, of Eccleston-terrace, esq. The improvement of the form of the stocks of rifles, carabines, and other fire-arms.

2465. C. Mather, of Salford, machinist. Improvements in drying yarns while in the hank.

2467. R. A. Brooman, of 166, Fleet-st., London, patent agent. Improvements in treating air and gases, and the employment of the same for obtaining motive power. A communication.

2469. A. Friedmann, of Frankfort-on-the-Maine, manufacturer of jewellery. An improvement in bracelets, necklets, and rings.

Dated November 5, 1858.

2471. T. Till, of Birmingham, mechanic. Improvements in machinery for making nails, and for other analogous purposes where metal is compressed by dies or stamps.

2473. C. J. Tjäder, of Stockholm, gentleman. Improvements in gun carriages, and in apparatus for lessening recoil.

2475. D. McClure, of Heaton Norris, cotton manufacturer. An improvement in the machinery used for the drying of yarn, thread, cloth, or other wet fabrics.

2477. L. S. Korf and F. C. Philippson, of Berlin. Improvements in machinery for boring holes in rocks and minerals, for blasting and other similar purposes.

2479. R. E. Pinhey, of Woolstan, Hants, and J. Wood, of Southampton. Improvements in apparatus for ascertaining the variation of ships' compasses for local errors.

Dated November 6, 1858.

2481. H. N. Penrice, of Norwich. Improvements in machinery for tunnelling and driving galleries through rock and other strata.

2483. B. W. Jonas and R. Jones, of Southwark. An improved ship's block.

2485. J. Cliff, of Lambeth. Improvements in the construction of kilns for burning stoneware, red clay ware, porcelain, and all other kinds of earthenware.

2487. W. Ziervogel, of Hettstädt, Prussia. Improvements in apparatus for distilling products from bituminous coal, schist, peat, and other like substances.

2489. J. Jackson, A. Fisher, and J. J. Harney, of Sheffield, crinoline manufacturers. Improvements in the manufacture of strips or bands of steel, and in the machinery or apparatus to be employed therein.

Dated November 8, 1858.

2491. J. Richmond, engineer, of Bow, J. Quick, jun., and A. Fraser, civil engineers, of Southwark. Construction of a meter for measuring water, spirits, or any other fluids.

2493. E. Alcan, of Coleman-st.-buildings, merchant. An improved method of treating or preparing materials to be manufactured into paper, applicable to lie-washings in general. A communication.

2495. J. Wardill, of Commercial-road East, engineer. Improvements in purchases for the raising and lowering of weights by means of chains, especially applicable to ships' capstans and windlasses.

2497. W. Hale, of John-st., Adelphi. Improvements in rockets.

2499. T. B. Marshall, of Queen-st., Cheapside, musical instrument maker. Improvements in drums.

2501. J. F. Amblet and A. Polart, of Amiens, France, manufacturers. Improvements in the manufacture of elastic fabrics.

Dated November 9, 1858.

2503. J. S. Dawes, of Smethwick, Birmingham, gentleman. A new or improved machine to be used for cultivating land, and which may be made applicable as a hoe, a skim, a turf or peat cutter; and a new or improved method of actuating the said machine and other machines used for like operations.

2505. J. L. Jullion, of Aberdeen, paper maker. Improvements in the manufacture of paper.

2507. A. Henderson, of Gloucester-pl., Portman-sq., master mariner. Improvements in vessels, and in applying rudders thereto.

2509. C. A. Bulkley, of New York. Improvements in the apparatus for ginning and cleaning cotton. A communication from S. R. Parkhurst, of New York.

2511. S. S. Marling, of Stanley-park, Gloucester, esq., and J. Apperly, of Dudbridge, near Stroud, woollen cloth manufacturer. Improvements in the construction of fulling machines.

2513. A. V. Newton, of Chancery-lane. Improved apparatus for obtaining extracts or decoctions. A communication.

2515. R. A. Brooman, of 166, Fleet-st., London, patent agent. Improvements in electric telegraphing. A communication.

Dated November 10, 1858.

2517. J. Norman, engineer, and R. Hannah, potter, of Glasgow. Improvements in furnaces.

2519. J. Buchanan, of Greenock, gentleman. Improvements in propelling vessels, ships, and boats.

2521. G. Schmidt, of Caroline-st., Bedford-sq. Improvements in the construction of core bars.

2523. G. Schmidt, of Caroline-st., Bedford-sq. Improvements in the manufacture of cast-iron pipes.

2525. G. Schmidt, of Caroline-st., Bedford-sq. Improvements in ladles employed when casting metals.

2527. C. T. Judkins, of York-road, Lambeth, engineer. Improvements in gas regulators.

Dated November 11, 1858.

2529. J. Lees, of Oldham, tin-plate worker, and W. Lees, of the same place, engineer. An improvement in the construction of oil-cans.

2531. F. H. Maberly, of Stowmarket, master of arts. Improvements in the construction of ships of war and other vessels, their machinery and appurtenances.

2533. A. V. Newton, of Chancery-lane. Improved apparatus for securing doors of safes, closets, and apartments. A communication.

2535. J. Rae, of New-cross. Improvements in cisterns suitable for containing water for household uses.

2537. J. Buchanan, of Greenock, gentleman. Improvements in propelling vessels, ships, and boats.

Dated November 12, 1858.

2539. J. Ogden, of Liverpool, commission agent. Improvements in shuttles for looms.

2541. D. Turner, of Whitechapel. Improvements in the manufacture of wood soles for clogs, boots, and shoes.

Dated November 13, 1858.

2543. M. N. Mills and N. Sidebotham, of Ashton-under-Lyne, machinists. Certain improvements in looms for weaving.

2545. J. Wadsworth, of Salford, machinist. Improvements in the construction of moveable or adjustable heels for boots and shoes, and of spurs adapted thereto, and to be used therewith.

2547. J. Courage, of Horsleydown, brewer, and F. Bennett, of Holywell, smelter. Improvements in furnaces for reducing and smelting ores, scoria, slag, and waste.

2549. D. Auld, of Glasgow, engineer. Improvements in furnaces and boilers, and in the generation and treatment of steam.

2551. L. Petre, of Hatton-garden, glass silverer. Improvements in the application of glass to ornamental and useful purposes.

2553. M. L. J. Lavater, of the Strand, india-rubber manufacturer. Improvements in the manufacture of mats, coverings for floors and other surfaces, and other cellular articles when india-rubber compounds are used.

2555. A. B. Woodcock and J. M. Dunlop, of Manchester. Improvements in covering rollers, shafts, and tubes of any figure or material with elastic shells or covers with vulcanised india rubber or other elastic substance, and in turning or grinding the surfaces of such elastic covers or shells.

2557. M. Pullan, of Horsforth, near Leeds, bleacher. Improvements in machinery for drying yarns and other materials.

Dated November 15, 1858.

2559. S. St. C. Massia, of Welbeck-st. A new economical guard for candles and wax lights.

2561. A. Dick, of Holywell, metallurgist. A new or improved manufacture of a yellow pigment.

2563. B. Predavalle, of Hart-st., civil engineer. Improvements in producing or obtaining motive power.

2565. M. G. Deschamps and J. Quinche, of Paris. A new compound metal which they term "Lutetia Metal."

2567. W. Clark, of Chancery-lane. A new mode of advertising. A communication from Berson and Beaujanot.

Dated November 16, 1858.

2569. J. Brennand, of Manchester, calico printer. Improvements in the method of effecting the locomotion of carriages, which improvements are also applicable to other similar purposes.

2571. J. C. Boisneau, of Chatellerault, France, engineer. An improved horse-mill or gear.

2573. J. Samuel, of Great George-st., Westminster, civil engineer. Improvements in sleepers or bearers for rails.

2577. T. Knauth, of New York, merchant. Improvements in fire-arms and ordnance. A communication.

Dated November 17, 1858.

2579. F. A. Gatty, of Accrington, manufacturing chemist. Improvements in producing certain colours on cotton, linen, and silk fabrics.

2581. M. A. Muir and J. McIlwham, of Glasgow, machinists. Improvements in looms for weaving.

2583. C. F. Vasserot, of Essex-st., Strand. A flat clothes smoothing-iron, with moveable handles. A communication from F. Rousserie, of Marseilles.

2585. D. W. Hayden, of Coleman-st., Arlington-sq., engineer. Improvements in apparatus for heating water and other liquids.

2587. J. Robertson, of Saint Ninians, Stirling, gentleman. Improvements in musical instruments.

2589. E. Mellor, of Rochdale, engineer. Improvements in mules and other machinery for spinning cotton and other fibrous substances, whereby the cop will be built much firmer, and prevent snarls in the yarn.

2591. J. Brennand, of Manchester, calico printer. An improvement in ploughs, and in other agricultural implements, and in the method of driving the same.

2593. S. Wheatcroft, of New North-road, engineer. Improved apparatus for uniting lace to blond and other fabrics.

2595. W. Clark, of Chancery-lane. A process of thickening, strengthening, and improving tanned hides. A communication from A. L. A. Favier, of Nancy.

2597. W. Clark, of Chancery-lane. An improved bit or bridle for horses. A communication from L. Varéille and L. H. Drevet.

NOTICES OF INTENTION TO PROCEED.

(From the "London Gazette," November 30th, 1858.)

1620. C. F. Vasserot. Manure. A communication.

1631. J. Schmitt. Rails and axles.

1635. J. C. Hill. Joints for pipes.

1636. R. Clarke. Windows, &c.

1642. W. and J. Asquith. Pile fabrics.

1645. M. Matley. Steam boilers.

1646. T. Piatti. Propeller.

1653. H. Green. Hinge.

1658. H. Higgins and T. S. Whitworth. Spinning and doubling.

1667. M. Shanly. A mercurial level. A communication.

1668. W. Merry. Drains, &c.

1674. D. Adamson. Hydraulic apparatus.

1675. C. F. Vasserot. Glass roofs, skylights, &c. A communication.

1676. A. Sax. Musical instruments.

1685. J. Hope. Engraving printer's rollers.

1687. P. A. Godefroy. Cleansing gutta percha.

1689. H. Ashton. Furnaces.

1696. A. Taylor. Pianofortes.

1705. H. Harden. Steam boilers.

1739. R. J. M. Cetti. Barometers, &c.

1756. T. Greenhalgh. Steam boilers.

1776. J. Luis. Truss. A communication.

1779. J. Luis. Wheels. A communication.

1782. J. Henderson. Weaving.

1785. R. A. Brooman. Knitting frames. A communication.

1825. S. F. Cottam. Doubling yarns.

1839. A. J. Paterson. Propelling.

1887. W. F. Padwick. Protecting crops from the fly.

1993. G. Price and W. Dawes. Steam engines, boilers, &c.

1998. J. Robertson. Driving belts and springs.

2000. E. Cocker. Spinning, &c.

2025. G. Larsonnier and A. Blanche. Block printing.

2195. H. Monier. Gas burner.

2224. D. Scattergood and R. W. Smith. Looped fabrics.

2253. J. B. Pascoe and J. R. Thomas. Condensing and gassing smoke, propelling ships, &c.

2427. E. T. Hughes. Preventing railway accidents. A communication.

2449. N. S. Dodge. India rubber. A communication.

2454. J. Tall. Brooms.

2455. D. Fryer, T. L. C. Watt, and W. Holmes. Tanning.

The full Titles of the Patents in the above List can be ascertained by referring back to their numbers in the Lists of Provisional Protections previously published.

Opposition can be entered to the granting of a Patent to any of the parties in the above List who have given notice of their intention to proceed, within twenty-one days from the date of the Gazette in which the notice appears, by leaving at the Commissioners' office particulars in writing of the objection to the application.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

2657. J. Wilkes.	2687. R. A. Brooman.
2662. G. E. Dering.	2699. P. L. Bergeon.
2667. W. E. Newton.	2705. R. J. Davis.
2676. J. H. Johnson.	2745. A. Paget.

LIST OF SEALED PATENTS.

Sealed November 25th, 1858.

1182. W. Bayliss.
1186. S. C. Lister and J. Warburton.
1188. F. Bouquié.
1207. E. Bond.
1210. W. & H. Hodgson.
1215. M. A. F. Mennons.
1220. J. B. Thornber.
1240. H. Brown, B. Hodgson, and J. Carter.
1270. R. Orr.
1283. J. B. A. Lombard and X. T. Esquiron.
1290. W. Clark.
1292. J. Bunnett.
1349. L. C. S Masson and F. de la Morinière.
1400. W. E. Newton.
1404. H. Deacon.
1495. S. Lees and J. Jaques.
1778. J. Luis.
2079. C. J. Redpath.
2128. F. F. Emery.
2149. W. Richards.
2183. J. J. Russell.
2265. A. Von Schuttenbach.

Sealed November 25th, 1858.

1232. R. W. Chandler and T. Oliver.
1245. R. Owen.
1246. W. Clayton and J. Goodfellow.
1247. J. Bethell.
1252. R. Owen.
1253. H. Edwards.
1271. A. Manbré.
1275. G. Hadfield.
1351. G. Adshead.
1383. S. Hewitt.
1398. W. C. Wilkins.
1449. W. H. Preece and J. L. Clark.
1459. W. E. Newton.
1485. F. Richmond & H. Chandler.
1509. J. Hodgkinson.
1643. E. Hardon.
1681. C. De Jongh.
1765. C. De Jongh.
2053. J. P. Koenig.
2117. T. Cook.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions.

NOTICE TO CORRESPONDENTS.

Articles and Correspondence designed for insertion in the ensuing Numbers of the *Mechanics' Magazine* must reach the Office by the Tuesday of each week, at the latest. It is highly desirable that they should be forwarded earlier if possible.

CONTENTS OF THIS NUMBER.

LONDON: Printed and Published by Richard Archibald Brooman, of 166, Fleet-street in the City of London. Sold by A. and W. Galignani, Rue Vivienne, Paris; Hodges and Smith, Dublin; W. C. Campbell and Co., Hamburgh.

Mechanics' Magazine.

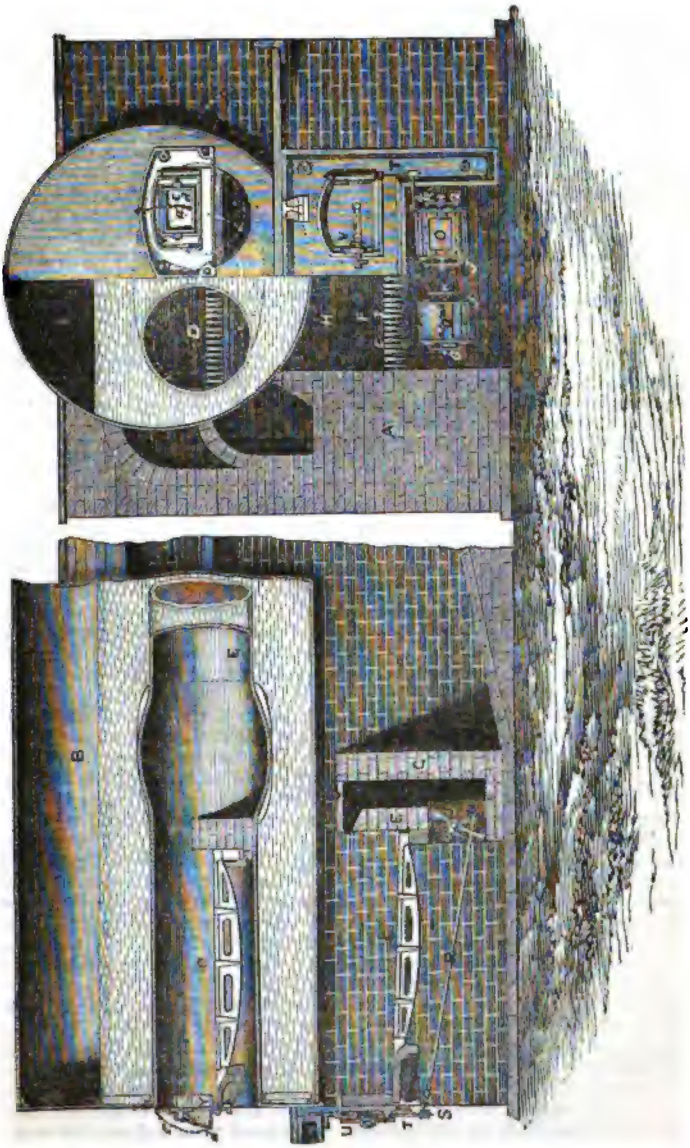
No. 1844.] SATURDAY, DECEMBER 11, 1858. [PRICE 3D.

Edited by R. A. Brooman and E. J. Reed, 166, Fleet-street, London, E.C.

AULD'S PATENT IMPROVEMENTS IN FURNACES.

Fig. 2.

Fig. 1.



AULD'S PATENT IMPROVEMENTS IN FURNACES.

MR. DAVID AULD, of Glasgow, engineer, has patented a set of improvements in working furnaces and steam boilers, and in apparatus connected therewith. His invention relates under one head to so arranging apparatus connected with the fire doors of furnaces that a due proportion of air shall be regularly supplied to the fuel and gases, so as to secure economy and prevent the emission of smoke. An air thoroughfare chamber is fitted up near the furnace, and the air way is put in communication with a double bridge at the back of the furnace, or with any other part of the furnace where it may be desired to supply the air. In the air case or thoroughfare chamber there is fitted up a balanced sand box, having an internal inclined diaphragm for directing the action of the falling sand as the box vibrates; this sand box acts itself as the air valve, suitable valve face pieces being fitted up in the thoroughfare chamber for the purpose. The sand box also carries a balance weight to insure its proper action. The box turns upon a horizontal central stud or shaft, and this shaft carries a small crank which is linked or connected to a crank on a spindle attached to the furnace door. In this way, when the fireman opens the fire door to throw in fresh or green fuel, the movement opens the sand box valve, admitting air to the furnace bridge or flues to the extent required; this valve now remains open until the gradual falling of the sand from one end of the box to the other causes it to turn upon its centre and shut the air passage. In this feature the invention very closely resembles that patented by Mr. M. Allen, and described at No. 1684 of the *Mechanics' Magazine*.

Under the second head, the invention relates to the efficient supplying of steam boilers with water. Over or above the level of the boiler there is fitted up a closed feed cistern, into which the feed water is primarily supplied. The feed pipe leading from the source of supply is passed through the side of the cistern and made to discharge into the interior of a cock or cylindrical valve chamber in the interior of the cistern; this valve acts by a partial revolution on its horizontal axis, and it has opening out from each end of it a branch pipe, the opposite ends of such pipes terminating in a hollow ball or spherical chamber. In this way the two pipes form combinedly a lever for the hollow ball, which is both a float and a weight. This valvular arrangement is put in communication with the boiler by means of two pipes, one passing down to the bottom of the boiler, and the other only to the proper working water level. Whenever the water level falls too low, the steam pipe which does not descend to the boiler's bottom becomes uncovered by the water, and steam then rushes up it, and enters the valve in the overhead cistern; at this time the hollow ball is at the bottom of the cistern, by reason of the weight of water in it and in the pipes, all those parts being filled; but the entering steam as it passes along one of the lever pipes dislodges all the water from the ball and pipes, and the ball consequently at once rises to the top of its ascent in the cistern. This movement then opens up the passage of the feed water into the boiler, through the low dipping pipe. When the proper working level of water has been again attained, the steam admission to the cistern is again closed by the water in the boiler, and no more water can then enter, as there is an unbalanced pressure opposing its admission; the hollow ball and pipes now fill again with water, and the ball descends in readiness for another action.

Under the third head of these improvements, the steam on its way from the boiler to operate in the engine cylinders is passed through a series of heating pipes arranged in the discharge flue or chamber which conducts the smoke to the chimney; in this way the steam receives an accession of heat, and is greatly improved for economical use.

The accompanying engravings illustrate one modification of the improvements in apparatus connected with furnaces for regulating the supply of air to the fuel. Fig. 1 is a longitudinal vertical section of a boiler heated by means of duplex furnaces, and having the improvements applied thereto; fig. 2 is an end elevation of the furnace, one half being in transverse vertical section, to show the internal arrangement; fig. 3 is an elevation or side view of the apparatus for controlling the admission of air to the burning fuel; and fig. 4 is a vertical section corresponding to fig. 3. Another modification is shown applied to the doors of the upper furnace in figs. 1 and 2.

The brickwork, A, on which the boiler, B, rests, is built in such manner as to form a furnace, C, below the shell of the boiler, The water within the boiler, B, is also heated by means of the furnaces, D, which are arranged within the longitudinal tubes, E, in the ordinary manner. Referring to the arrangement shown in the lower furnace, C, the bridge, F, over which the flame and incombustible products pass on their passage to the flues, is built to form a chamber through which the supply of air is admitted, that is to say, the bridge, F, is built of fire brick in the usual way; behind this is a wall, G, leaving a space between the two, as shown in fig. 1. The space between the bridge, F, and the wall, G, is covered at the upper part with slabs of fire-clay, H; these slabs are

supported at intervals on the bridge, F, so as to leave narrow longitudinal slits or openings between the bridge and the slabs, as shown in fig. 2.

The furnace bars, I, are arranged in the ordinary manner, as are also the other internal parts of the furnace. The bridge, F, is built completely across the space between the side walls, but in the lower part, two openings are left in the brickwork, in which openings are fitted the apparatus, by means of which the air is admitted to the back part of the fire. The apparatus consists of a rectangular box or casing, J, which is set into the brickwork, F, this box or casing forming the inlet for the air. It has across the upper part a downwardly directed angular ridge or fin, K, and the flooring or lower portion, L, of the box or casing forms an inclined plane ascending towards the back part of the box, as shown in fig. 4. To each side of the box, J, is bolted a bow or curved piece of metal, M, through the centre of which passes a screw, N; the pair of screws thus arranged from the adjustable pivots on which is carried a balanced box, O, the sides of which are cast with projecting spindles. The ends of these spindles project out beyond the slots which are made for the purpose in the side of the casing, J; the screws, N, enter the hollow ends of the spindles, and in this manner the box, O, oscillates freely upon its supporting pivots. The box, O, is of a rectangular figure, the front plate being secured to the back part by bolts and nuts, to afford access to its interior when necessary. The back part of the box, O, is made with an upwardly directed angular partition, P, this partition extends from side to side of the box, and at its lowest part a series of holes is made through which the contents of the partitioned part escape to the bottom of the box, O. A lever, Q, is fast to one of the spindles of the box, O, to the lower end of this lever a rod, R, is secured, the front extremity of which is jointed to a link, S. The other end of this link is fast to the spindle, T, on which the furnace door, U, is hung in such manner that the spindle rotates in its sockets with the opening and closing of the door. The upper ex-

Fig. 3.

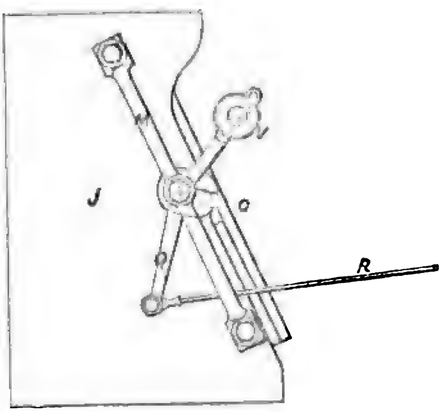
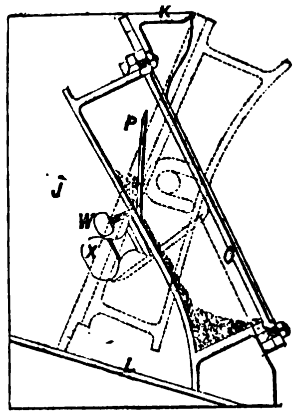


Fig. 4.



tremity of the lever, Q, is slotted to receive a counterweight, V, which is fastened to the lever by means of a nut, so that it may be fixed at any part within the range of the slot. A quantity of sand is placed within the box, O, the gradual descent of which from the upper to the lower part of the box causes it to turn slowly upon its axis, this motion serving to cut off the ingress of the air. When the furnace door is opened for the purpose of supplying the fire with fresh fuel, the rod, R, is drawn forward, which has the effect of pulling the lever, Q, so as to cause the box, O, to fall backwards. This sudden inversion of the box, causes the sand contained therein to be thrown to the upper part of the box, so that it falls behind the partition, P, the shifting of the sand being facilitated by the smart blow with which the upper projecting edge of the box comes in contact with the inclined plane, L, and the upper part of the casing, J; the box in its inverted position is shown in dotted lines in fig. 4. The furnace door now being closed, the box, O, does not return to its former position in consequence of the preponderating weight in the upper part, which is so arranged that the bottom of the partition, P, is a little above the horizontal line. The metal knob, X, serves also to keep the box in equilibrio, as well as to assist the inverting movement. The air has now free access above and below the box, O, and as it emerges through the openings between the bridge, F, and the slabs, H, it

meets the smoke arising from the fresh fuel, the combustible portion of which it ignites. In its passage through the air chamber formed by the walls F and G it becomes heated, so that the furnace is not injuriously cooled down by this influx of fresh air. As the quantity of smoke decreases, it is necessary to diminish in a corresponding ratio the admission of the air; to this end the box, O, must be caused to slowly close the opening in the casing, J. This is accomplished by the gravitating action of the sand which escapes through the apertures made for the purpose in the lower part of the partition, P, the escape being regulated by the screws, W. As the bottom of the box becomes heavier by the addition of the sand, it gradually approaches the vertical position, at each instant lessening the opening and the quantity of air admitted until the upper and lower projecting edges of the box are in contact with the ridge, K, and the inclined plane, L. In this position of the box, O, all further ingress of air is stopped, except that which passes through the furnace bars, and so the box remains until it is necessary to put a fresh supply of fuel upon the fire.

Another mode of arranging this self-acting apparatus is shown as applied to the furnaces, D. In this modification the valvular apparatus is fitted in the door of each furnace instead of being below the fire-bars, as before described. The furnace door, Y, is cast with a rectangular opening therein, in which is fixed the box or casting Z, the back part of which is perforated, as shown in fig. 1. At each side of the casing, Z, a slot or opening is cast in the metal, in which rests the spindles of the oscillating box, *a*; the upper part of the casing, Z, has an overhanging edge, against which the top part of the box, *a*, comes in contact when the valvular opening is closed. The interior of the box, *a*, is furnished with an angularly disposed partition, *b*, which has apertures at the bottom for the escape of the sand. These apertures may be partially or wholly closed by the screws, *c*, so as to afford the means of regulating the flow of the sand into the lower compartment. An eye or hook, *d*, is screwed into the lower part of the front of the box, *a*, and to this eye or hook a chain, *e*, is secured; the other extremity of the chain is made fast to a hook or staple fixed overhead. As thus arranged, the effect of opening the furnace door will be that the drag upon the chain will cause the box, *a*, to fall backwards and jerk the sand contained therein to the upper part of the box, whence it falls behind the partition, *b*. The box, *a*, is so poised upon its supporting spindles, that when the door of the furnace is shut the lower part of the partition, *b*, is a little above the horizontal line, so that whilst the air has free access to the furnace through the valvular opening, the box is sufficiently inclined to allow of the sand flowing through the apertures in the partition, *c*, into the lower compartment. In both arrangements of the valvular apparatus the time which the box takes to close the opening in the casing is adjusted to the quantity of fuel thrown upon the fire at each charge, the object being to close the valvular opening just as the fuel reaches a red heat, and smoke is no longer given off; after this the whole of the air admitted to the furnace must pass through the furnace bars. One or other of the arrangements of self-acting valvular apparatus may with trifling or unimportant modifications be applied either to stationary, locomotive, or marine boilers, so as to ignite all the combustible matters arising from the fuel, and thereby prevent the emission of visible smoke. In the arrangement last described, the air admitted through the valvular casing, enters in a series of finely divided streams, being in a condition peculiarly favourable for the complete and effective combustion of the gaseous products.

ON NAVAL WARFARE WITH STEAM.

BY GENERAL SIR HOWARD DOUGLAS, BART., G.C.B., F.R.S., &c., &c.*

We are now at the commencement of a new era in naval warfare, in consequence of the introduction of steam as a propelling power for ships, and its application by all the maritime powers of Europe to vessels of war, from those of the lowest class to line-of-battle ships of the greatest magnitude. This new power will necessarily modify, and, to a great extent, overturn the present tactics of war on the ocean.

Hitherto the execution of naval evolutions has depended on atmospherical conditions, and often the best concerted plans for attack or defence at sea have been frustrated, when at the point of being successfully carried out, by sudden calms, or by unforeseen changes in the direction of the wind; while now, an elaborate system of appropriate machinery, put in motion by the expansive force of steam, by enabling a vessel to be moved at pleasure, with more or less rapidity, or to be brought to a state of rest, or again, to have the direction of its motion changed through the

* The above article forms the introduction to a new work by Sir Howard Douglas, which will be reviewed in the first Number of the New Series of this Magazine, to be published Dec. 31st.

guiding power of the helm, will enable the commander of a ship or fleet to put in practice, without risk of failure, whatever manœuvre he may have determined on, whether for coming to action, or for counteracting the measures taken by his opponent, previously to, or during all the battle movements of the fleet.

It is generally supposed that the present naval supremacy of Great Britain is mainly due to circumstances arising out of the particular nature of the moving power by which the evolutions of vessels, singly or in fleets, have been performed. That moving power is the wind acting on the sails of the ships—a power in its nature very variable: and it is evident that the introduction of steam as a propelling power, whose action is entirely under the control of the engineer, will bring about great changes in the relative conditions of British and foreign navies, affecting, in consequence, the maritime importance of the several European nations.

This subject has already attracted the notice of scientific men in foreign countries; and an opinion prevails abroad, that the employment of steam as a moving power for ships of war will be attended with results beneficial to the nations of the Continent, while it will operate to the disadvantage of Great Britain.*

It is supposed that to superior tactical skill in our commanders, in anticipating the effects likely to arise from variations in the force and direction of the wind, and to the superior practical experience and expertness of our operative seamen in executing the orders of the officers, with respect to the manipulation of the rigging and sails, the British navy is in a great measure indebted for the success which has hitherto attended it in the hostile collisions of its ships with those of other nations; and it is observed that when the complicated manœuvres required to govern the motion of a ship under sail shall be superseded by the more simple management of steam machinery, naval warfare under steam will be in a great measure independent of nautical skill and good practical seamanship, and that the evolutions of a fleet will be reduced almost to the precision of military movements in the field. It is hence argued that on the employment of steam-propulsion for ships of war becoming general in Europe, that supremacy which our warlike navy has so long and so happily for us maintained, will cease to exist, and that other nations, less rich in nautical resources, but more abundant in those, both personal and material, which are required for military service on land, will become relatively more powerful than they were under the former conditions.

But does it necessarily follow that Great Britain will no longer maintain her present superiority in naval warfare? or, if so, will her decline be wholly due to the employment of steam-propulsion in ships of war? The author ventures to think that such an opinion is unfounded, and that it can have been formed only on the presumption that our nautical science and mechanical skill are to remain stationary, while those of other nations go on improving. In this case there would, indeed, come a time when the superiority would be on the Continental side, but nothing appears, at present, to justify such a presumption. Our seamen, of all ranks, are admitted to have, at this time, greater skill than those of other nations, not only in naval evolutions under sail, but also in the management of steam machinery; and they continue to be diligently trained in all that relates to naval tactics with wind or steam: thus they are prepared to avail themselves of every improvement that science and practice can suggest for the augmentation of their professional attainments.

This circumstance alone, *cæteris paribus*, should enable British commanders to preserve their present superiority over those of the Continent; but how much greater are the advantages of our country, in respect of its seamen, over every other nation! Foreign seamen, being taken, chiefly by conscription, from towns or fields, have seldom more than that training which can be given them in ships of war, on board of which they serve almost wholly within the limits of the European waters; whereas our sailors, exerting the energies of a people long habituated to maritime pursuits, are trained in our vast mercantile marine to the performance of their duties in every region of the earth, while employed in transporting merchandise between the mother country and its widely extended colonial dominions.

Our superiority holds good also with respect to their training in the employment of steam. The machinery for the propulsion of a British steamer is the best that can be executed, and the engineers who attend it are well known to have greater

* "Des machines puissantes du genre d'un moteur obéissant rendra inutiles et la marine et les marins à voile dont la Grande Bretagne est un ruche si féconde."—*Des Propulsions Sous-Marins*, par M. Labrouse, 1843.

"Ce changement rendra l'expérience et les habitudes navales moins utiles, et tournera à l'avantage de la France bien plus que de l'Angleterre."—Paixhans, *Sur une Arme Nouvelle Maritime*, p. 28.

"La vapeur menaçait l'Angleterre de mettre la marine à la portée de tout grand peuple qui aurait des soldats aguerris et des finances prospérés. . . . La vapeur, pénétrons-nous bien de cette vérité, place la question de suprématie maritime sur un terrain plus abordable pour nous."—De La Gravière, *Guerres Maritimes*, vol. ii., pp. 256, 264.

skill and more experience than men of the like class in other nations; Englishmen are, in fact, generally employed to work the engines on board of the mercantile steamers of foreign countries; and no reason can be given why their skill and their energies should be stationary, or not keep pace with their increasing opportunities for improvement.

It may, therefore, be safely affirmed that the advantages which Great Britain has so long enjoyed in her maritime superiority, will rather be increased than lessened under the new and as yet untried power of motion; and it may be reasonably supposed that other nations will continue to follow rather than lead us in the career of nautical warfare. The subject is, however, one of momentous importance to us, and it should engage us to bring every possible consideration to bear on the means by which Great Britain may, even at the outset, be enabled to maintain that superiority in steam warfare, which has already been obtained for her by the skill and intrepidity of the officers and seamen of her glorious sailing navy.

New discoveries in the means and implements of war have at all times been necessarily attended, both in fleets and armies, by new formations in the array of battle, and by modifications, or entire changes, in their tactical evolutions. The greatest change in these respects took place at the epoch of the first employment of gunpowder in warfare; but every improvement in arms has, since that time, constantly led to counteracting measures being taken in organization and movements both naval and military, of which the history of military science affords abundant examples. It must be observed, however, that alterations in tactics have always been made by slow degrees, and have generally followed at long intervals the improvements which rendered them necessary. At the present time it may be said that no efficient change has yet been made in military tactics to meet the introduction of the improved rifle as a general arm for the infantry of the line.

The employment of steam as a motive power in the warlike navies of all maritime nations, is a vast and sudden change in the means of engaging in action on the seas, which must produce an entire revolution in naval warfare, and must render necessary the immediate adoption of new measures in tactics, and new material resources; these should be forthwith studied, and provided, with all the mental and physical energies which the talent and wealth of this country can exert; in particular, no money should be spared, considering the magnitude of the object at stake,—no less than the preservation of our naval supremacy,—in procuring all that is necessary to meet the requirements of the service at this momentous epoch.

The changes which political events have produced in the maritime affairs of all the nations of Europe, and the great improvements which have been made in naval constructions and armaments, and particularly the introduction of steam as a motive power since the termination of the wars arising from the great French Revolution, are matters with which it behoves the statesmen of this country to be thoroughly acquainted. One great naval power in Europe has disappeared as such, and another has sprung up in the New World. The steam fleet of France is in a state of progressive augmentation; the government of that country having acted upon the decision of its "*Commission d'Enquête,*" of 1849,* and has now attained a very formidable degree of strength. The division of the Russian fleet now in the Baltic, amounting to about forty sail of the line, will speedily become a steam fleet, and the navies of the minor powers, Denmark, Sweden, and Holland, under the able administrations of those countries, are in a very efficient state. In short, the navies of Europe and of America have so increased in the number and strength of the ships, and their *personnel*, in all that relates to the science and practice of war, that, in a future contest, the sea will become the theatre of events, more important and decisive than have ever yet been witnessed.

The efforts of our nearest continental neighbours have been particularly directed during the last nine years to the re-attainment of that rank and consideration which their nation formerly held among the naval powers of the world; and, admitting this to be a just and laudable policy for France to pursue, Great Britain should, at the same time, keep steadily in view the measures now being carried out in that country, conformably to the recommendation of the Commission of Inquiry just referred to, and must take corresponding measures to increase in due proportion the power, efficiency, and numerical strength of her naval forces, in order to maintain her present position. Thus, the naval arsenals of two great nations in alliance with each other, one of them impelled by a necessity of the first and highest order—that of providing effectually for its own security, are resounding with the din of warlike preparations, while both nations might be participating in the financial advantages and social bene-

* See the 'Enquête Parlementaire, sur la Situation et l'Organisation des Services de la Marine Militaire, ordonnée par la Loi du 31 Octobre, 1849.' Paris, Imprimerie Nationale, 1851.

fits of a sound, substantial, and lasting peace.

It may be proper to observe here, that the Commission of Inquiry, in its sitting of the 3rd February, 1851, decided that the number of ships of the line which, by the Ordonnance of 1846, was limited to forty, should be increased to forty-five, and that each ship should be provided with steam power. This was number adopted, but it appears from the discussion which took place on the occasion, that the proposition of M. Charner, one of the members of the Commission, to increase the number to fifty ships of the line was rather postponed than rejected. It was recommended to have the greatest number possible of ships of the line finished, afloat, and ready armed whenever they might be required. The reason for adopting the smaller number was, that forty-five ships would be finished in less time, and thus the funds voted would be economised, and the country be better prepared in the event of war soon breaking out. The number of ships actually finished is forty-seven, and there is little doubt that it will soon amount to fifty, as proposed by M. Charner.

In the sittings of the 12th February and the 10th March, 1851, it was resolved that the number of steam-frigates, *à grande vitesse*, should be twenty, of frigates moved by sail and steam, also twenty; at the same sitting it was decided that the number of corvettes should be fixed at fifty, and that there should be eighty avisos. It was also decided that the construction of the twenty swift steam-frigates and the fifty corvettes should be completed gradually within the next ten years; at the same time it was determined that all sailing transports should be suppressed; and that, instead of them, there should be twenty steamers to serve as transports.* The line-of-battle steamers are recommended to be built on the model of the *Napoléon*, formerly the *Vingt-quatre-Fevrier;* the engines of this ship, though rated at 960 horse-power, can be worked up to 1,500 horse-power, and the ship is capable of stowing coal for ten days when steaming at full speed. It was subsequently resolved that the "Equipages de ligne" (ships' crews), and the "Mécaniciens," or engine-men, should continue to be kept up by means of the maritime conscription; that fourteen ships of the line then afloat should undergo the alterations necessary to convert them into steam-ships; that the number should be made up to thirty from the ships then on the stocks, and that twenty of them should be completed within ten years.

In the decision respecting the establishment of ships' crews, for manning the forty-five ships of the line, decreed by the Ordonnance of 1846, it was regulated that an adequate increase should be made in the number of companies, each of which was appointed to consist of sixty seamen of the first, second, and third classes, with twenty seamen apprentices; also that the establishment of seamen-gunners should be on so large a scale, that there might be one well-trained gunner to every gun in the ships to which they should be drafted.

The decisions of French Commissioners, on subjects referred to them, are not subject to change with a change of government, as with us; they are, on the contrary, immutable, and are perseveringly acted upon till they are effectually carried out. It is well known that the idea of constructing a great harbour at Cherbourg originated with Louis XIV., though the work was commenced only in the reign of Louis XVI.; and, in the present year we have seen the completion of that vast work, which, in the language of the President of the Commission appointed in 1849, "is to contain the fleets which are to defend the French coasts and attack the English in their own country."*

Viewing France as that which she really is, a great power, whose safety depends upon her military forces, we have no right to cavil at any measures which the government of that country may adopt for its own security against its powerful continental neighbours. Her military preponderance is as essential to her safety as the maritime preponderance of Great Britain (an insular and colonial power) is indispensable to hers. Neither should be jealous nor distrustful of the other in any legitimate use which either may make of the powers with which nature has endowed them, respectively, for providing effectually for their own security.

The author makes these observations in no unfriendly spirit; he takes facts and circumstances as he finds them, and he uses them merely in proof of the necessity which Great Britain is under of taking corresponding measures to secure her own

* The transport *Calvados*, which was lately launched at L'Orient, the first of twenty vessels of the same class, is said to have accommodation for 2,500 men, 150 horses, and 1,200 tons of stores.

* In a speech delivered at a sitting of the Commission of Inquiry before referred to, Jan. 27th, 1851 ("Enquête Parlementaire," tom. i., p. 149), M. Daru, after observing that, in the expedition to Rome, the whole French army was embarked and conveyed in ten days from Toulon to Civita Vecchia, infers that 24 steam frigates, 24 transports, 3 corvettes, and 3 avisos, concentrated at Dunkirk, Cherbourg, or Brest, would suffice to disembark 30,000 men and 3,000 horses on any part of Great Britain or Ireland.

position, as a great maritime nation, among the powers of Europe. Sincerely disposed to value and maintain, in his humble sphere, the friendly relations which happily subsist between the governments of England and France, and relying on the assurances lately given by the head of the French nation, the author cannot but admire the policy by which the government of France is actuated in so reorganizing its maritime resources as to raise its navy to the highest possible degree of efficiency. Great Britain, as an insular and colonial empire, can maintain that high position in the rank of nations which she has gained by the instrumentality of her navy, only by keeping that noble branch of her service, not merely in a state barely sufficient to protect herself against any one maritime power, but fully adequate to defeat any maritime coalition to which political circumstances may at any future time give rise. And it must always be borne in mind, that, to enable the navy of Great Britain to act on equal terms with that of any continental nation, it ought by far to exceed the navy of such nation in the number of ships of war of like force. Taking France, for example; while the naval power of that country will, in the event of a war, be chiefly collected in the two seas, on the shores of which her great arsenals are established, that of our country must be dispersed over the whole world with strength sufficient, in every region, to protect her numerous colonies and widely-extended commerce. The fleets of England will, in time of war, have to blockade two great ports in the British Channel, instead of one, as in former wars, and must, moreover, have dominant power in all the waters which surround the British Isles.

The manning of the British navy, was, in former times, so promptly accomplished by compulsory service, that, often, the dangers which menaced the country by sea were averted by a consciousness, on the part of the enemy, that our fleets were fully prepared to oppose any attempt at aggression. But now that the Government depends upon a voluntary enlistment for the supply of seamen to man our ships of war, there is always a risk of delays taking place when a fleet is to be fitted for service; it will signify little that we have abundance of ships and of the *matériel* for arming them, if the brave men who are to serve in them are not forthcoming at the time of need. The French have still their law of compulsory enrolment, from which they form their ships' companies; but Great Britain has only the inducement which a liberal bounty and a careful attention to comfort on board the ships offer, to enable her to procure the men who are to defend the country and maintain the glory of her arms in naval warfare.

A brief notice of naval tactics under sail is necessary, because it will be long before sails can be entirely superseded by steam-engines, if this supercession should ever take place. Steam fleets will be compelled occasionally, from exhaustion of fuel or derangement of the machinery, to have recourse to sails; and it is evident, therefore, that tactics with sails must not be hastily disregarded. A tract on naval warfare with steam is, however, indispensable at the present time, since evolutions which cannot be executed with precision and certainty, or even cannot be executed at all, with the sail, may be effectually accomplished by the steam machinery, while new evolutions and new formations must be subjects of contemplation; and thus it is imperative that our seamen should render themselves equally expert in both systems. Before entering, however, upon the subject of naval tactics with steam, it will be proper to devote a section to the purpose of giving a brief history of the introduction of steam as a moving power to ships, and a brief notice of the nature and action of steam-machinery in its application to the *paddle* and the *screw*, together with an inquiry into the relative values of these agents, with respect to their powers of communicating motion, and to their conveniences in the armament of ships of war.*

THE NEW FOREIGN OFFICES.

"Mr. Scott has been selected by Lord John Manners as the architect to erect the new Foreign Offices."

This announcement at once recalls many circumstances attendant upon the competitive exhibition for the new Government offices—circumstances the allusion to which is both painful and humiliating. The programme published by authority contained rules and regulations for the guidance of the architects, a non-compliance with which, it would be presumed, should have been in itself sufficient to place the innovator beyond the pale of competition. Yet, in the face of these well-defined lines of demarcation, a very few architects took the trouble to comply with these instructions. The requirements were specific, and should have formed the indispensable *basis* for their conceptions. Had the programme

* This last sentence refers to the work, on "Naval Warfare," before alluded to.

been placed in the Exhibition, a reference to its text would have permitted the public —ignorant as it might be of the technicalities of art—to have judged for itself, and the shamless departures from a presumedly unwavering authority would have made itself manifest to all but the most casual observer. The drawings, *as drawings*, were singularly good, all the effect of light and shade, of accessories of figure and colour, which the members of the Water Colour Society could render the sister art, were there. But, alas! even the washing-in of cool grey shadows, and the bustle and life accorded to the design by the pencil of a Rowbotham, or any other artist whose avocation it is to put in effects to order, could not disguise the utter paucity of architectural genius, or even of talent, in most of the designs. The general impression this display made upon the intelligent architects of Europe was far from flattering. The notion, as culled from foreign art-journals of the period, appeared to be in strict accordance with that entertained by the better-informed at home—that our architects are inoculated throughout with the conviction that style is architecture, whereas style is only the dress, and a consequence of the disposition, and of the manner of building. Having thus mistaken their way to a sound disposition, they altogether lost sight of the first element of a good composition. Had the several competitors been true to the programme, we necessarily should have found upon the walls but one description of translation, the several examples differing but little from one another, for the programme, so accurately defined, did not admit of being answered in more than one way. Yet what had we? Designs without carriage-entrances, so that visitors would have to alight and walk some distance to any one of its departments; court-yards with broken, shapeless forms—wells, in fact, shut in by the surrounding buildings, and thus incapable of affording either air or light to the neighbouring portions of the edifice; little or no facility for communication inside; staircases dark; corridors intercepting the offices which ought, in a Government institution, to be close together—at least, those of the same department, for the better security and secresy of business. These dark corridors set all our boasted improvements for ventilation at defiance, and would tend to render an appointment in the Foreign Office far from an enviable situation. Indeed, by the evidence offered at this exhibition, Gothic architecture was interpreted as dark, gloomy, and confined, and consisted of narrow and tortuous ways—thereby providing, it is true, a new outlet for patronage in the formation of a corps of conductors to show the otherwise lost their way through the ingenious labyrinth.

With regard to the style, upon which so much stress is laid, we have young edifices affecting all the airs of wrinkled age, antiquaries' dreams, servile copies of past ages little in common with the wants of the present era. Well may the question be here repeated, Have we not had enough of the Elizabethan and variously named styles—why not have a Victorian style?

We have, however, to regret that the programme insisted upon a detail of a part of the block plan. This interfered with and embarrassed the general design without any equivalent advantage. An architect should himself be made acquainted with the wants to be supplied, the locality, the climate, and the materials available for the building. No programme should be permitted to hamper his combinations. A right disposal of the space at his command should provide for all requirements; he should give expansive entrances, ready access to all parts, ample light and air, and thus ensure throughout as healthful a state of things as is possible of attainment; and yet should erect a building that will be strong, complete in itself, handsome to behold, and capable of being added to and extended if required without a disturbance of the general unity and beauty of the conception. We may hereafter find that a system which permits the present to provide for the future is both wise and rational.

To return to the present results:—can it be possible that the judges compared the several projects with the official programme? The reply is obvious. They did not. But by what rules they were influenced in awarding the premiums must ever remain a mystery, for, had they done what they professed to do, very few premiums, if any, would have been awarded. We know that this view of the matter is shared by many of correct taste; but what is to be said of that of a Committee whose judgment led them to vote a premium to a drawing by one of the students of the French Academy—a mere tracing similar to those made by every student whether of Germany or France in the early stages of his probation?

It is refreshing to feel that there is renovated life and practical genius amongst many of our young architects, who evidently see and appreciate what is really wanted to revivify the art, and who are, both in our metropolis and in the provinces, giving practical evidences of the faith that is in them.

Since writing the above much has appeared in the *Times*, and other public *media*, upon this subject; but each corre-

spondent only rides in turn the one hobby; and that hobby is yclept "style." As far as we are concerned we alone take an interest in the powerful and creative minds of the independent portion of a liberal profession who are unbiassed and unshackled by the influences of an aristocratic atmosphere, or the "sickly sentimental" Romantism of Mr. Hope, M.P., and his hopeful clique.

Gothic, like every other style of art, had to thank for its origin and development the spirit of the times in which it had its being. But circumstances change, although the same religion may exist. The fundamental rules that guided the societies of the middle ages and its masonic orders have passed away, and are no longer appreciated, if, indeed, they are understood; nor are they practicable in our free-trade times if they were. But for the lamentable and ridiculous attempts of a few professional old women —pedantic schoolmasters and hypocritical aspirants for the loaves and fishes, under the protection of those in power, we should long ere this have had to boast of the successful triumphs of genius, founded upon novelty and fitness of purpose, without being compelled to throw aside the really useful and good which we inherit from the venerable old masters. Indeed, as Michael Angelo has it, "he that only copies never can rise to be a real artist." No more are the vicious copyists of our own times above the distinction of patternmongers, authority hunters, and tailoring architects, who, with their sample books beneath their arms, are all things to their patrons, and nothing without them. If it be really true that Mr. Hope has, by his close relationship to the Lord President of Her Majesty's Ministry, and the Woods and Forests First Commissioner, influenced this late decision—*if* actually a decision has been arrived at—we can only lament that another blow has been aimed at the integrity of competition and the creation of a new national style. We are compelled to allude to this rumour; but, as Lord Salisbury is an architect himself in feeling, and a patron of Elizabethan and classic architecture in its essence, and known for his strict love of justice, we cannot believe he has lent himself to the perpetration of any such transparent absurdities.

Time was, when George the Fourth was king, that the architects' sample books were full of pagodas borrowed from the Chinese, and we have even been threatened with Alhambrandism; but these art diseases have happily passed away. In another century the Gothic will have "died out," as is the natural fate of all sentimental matters of fashion.

MR. CHARLES DICKENS ON WORKING-CLASS EDUCATION.

On Friday evening, Dec. 3, a public meeting, attended by about 1,000 persons, was held at the Free-Trade Hall, Manchester, to distribute the prizes and certificates to the successful competitors in the recent examinations at the Lancashire and Cheshire Institutional Association. Mr. Charles Dickens, who presided, explained the objects of the association, and proceeded to say:—"This Institutional Association is the union in one central head of 114 local institutions and mutual improvement societies, at an expense of no more than 5s. to each society, suggesting to all how they can best communicate with, and profit by, the fountain head and one another, keeping their best aims steadily before them, advising them how those aims can be best attained, giving direct end and object to what might otherwise easily become waste forces, and sending among them not only oral teachers, but, better still, boxes of excellent books, called 'Free Itinerating Libraries.' I learn that these books are constantly making the circuit of hundreds upon hundreds of miles, and are constantly being read with inexpressible relish by thousands upon thousands of toiling people, and that they are never damaged or defaced by one rude hand. I have looked over a few of the examination papers. They comprise history, geography, grammar, arithmetic, book-keeping, decimal coinage, mensuration, mathematics, social economy, the French language—in fact, they comprise all the keys that open all the locks of knowledge. I could not but consider with extraordinary admiration that these questions have been replied to, not by men like myself, the business of whose life is with writing and with books, but by men the business of whose life is with tools and machinery. Let me name a few of the most interesting cases of prizeholders and certificate gainers who will appear before you. There are two poor brothers from near Chorley who work from morning to night in a coalpit, and who, in all weathers, have walked eight miles a night three nights a week to attend the classes in which they have gained distinction. There are two other poor boys from Bollington, who began life as piercers at a shilling and eighteenpence a week and the father of one of whom was cut to pieces by the machinery at which he worked, but not before he had himself founded the institution in which his son has since come to be taught. These two poor boys have taken the second-class prize in chymistry. There is a plasterer from Bury, sixteen years of age, who took

a third-class certificate last year at the hands of Lord Brougham, and who has exerted himself so strenuously since, that he is this year again successful in a competition three times as severe. There is a wagon-maker from the same place, who knew little or absolutely nothing until he was a grown man, and who has learned all he knows, which is a great deal, in the local institution. There is a chain-maker, in very humble circumstances, and working hard all day, who walked six miles a night three nights a week to attend the classes in which he has won a famous place. There is a moulder in an iron foundry, who, while he was working twelve hours a day before the furnace, got up at four o'clock in the morning to learn drawing. There is a piercer at mule frames, who could not read at eighteen, who is now a man of little more than thirty, who is the sole support of an aged mother, who is arithmetical teacher in the institution in which he himself was taught, who reports of himself that he made the resolution never to take up a subject without keeping to it, and who has kept to it with such an astonishing will that he is now well versed in Euclid and in algebra, and is the best French scholar in Stockport. The drawing classes in that same Stockport are taught by a working blacksmith, and his pupils will receive the highest honours of to-night. To pass from the successful candidates to the delegates from local societies, and to content myself with one instance, there is among their number a most remarkable man, whose story I have read with feelings that I could not adequately express under any circumstances, and least of all when I know he hears me—who worked when he was a mere baby at handloom weaving until he dropped from fatigue, who began to teach himself as soon as he could earn 5s. a week, who is now a botanist, and acquainted with every production of the Lancashire valleys; who is now a naturalist, who has made and preserved a collection of the eggs of British birds, and stuffed the birds; who is now a conchologist with a very curious, and, in some respects, original collection of fresh-water shells, who has also collected and preserved the mosses of fresh waters and of the sea, who is worthily the president of his own local literary institution, and who was at his work this time last night as foreman in a mill. So stimulating has been the influence of these bright examples and many more, that I notice among the applications from Blackburn for preliminary test examination papers one from an applicant who gravely describes himself as ten years of age, and who, with equal gravity, describes his occupation as 'nursing a little child.' The women employed in factories, in millinery, and in domestic service have begun to show, as it is fitting they should, a most decided determination not to be outdone by the men. The women of Preston, in particular, have so honourably distinguished themselves, and show in their examination papers such an admirable knowledge of the sense of household management and economy, that if I were a working bachelor of Lancashire or Cheshire, and if I had not cast my eye or set my heart on any lass in particular, I should positively get up at four o'clock in the morning, with the determination of the iron-moulder himself, and should go to Preston in search of a wife." The chairman then distributed the prizes to the successful candidates, with each of whom he cordially shook hands.

RAILWAY GRADIENTS AND CURVES.

The whole of the evening of Nov. 30 was occupied, at the Institution of Civil Engineers, Nov. 30, 1858 (G. P. Bidder, Esq., Vice-President, in the chair), by the discussion of Mr. Isaac's paper on the above subject.

It was explained that on the Baltimore and Ohio Railway, the ordinary goods engines had cylinders of 19 ins. diameter, with a stroke of 22 ins.; they had eight driving wheels of 3 ft. 7 ins. diameter, all coupled. The passenger engines principally employed on the inclines of 1 in 45½, had cylinders of 19 ins. diameter, and 22 ins. stroke, with six driving wheels 4 ft. 2 ins. diameter, all coupled, and a leading truck, or bogie, on four wheels. Peculiar arrangements were made for facilitating the passage over curves of small radius; the centres of the front and hind wheels were only 11 ft. 3 ins. apart, and the intermediate wheels were without any flanches, the springs being so adjusted as to equalize the weight.

It was stated, that the adhesion of driving-wheels had been shown, from experience in the United States, to be beyond the limits usually assigned. Instances were known where the effective adhesion had been as much as two-fifths of the nominal weight on the driving-wheels; it being assumed that this varied much when running, as compared with the actual weight ascertained by the weighing machine, when at rest.

On the Cleveland and Pittsburgh Railway, on the 1st August, 1857, a train of fifty loaded wagons, each on eight wheels, and weighing, with the engine and tender, 800 tons, was drawn up a continuous incline, two miles in length, of 1 in 132.

The engine weighed 26·8 tons, with only 19·2 tons on the six coupled wheels. The gravity of the entire train would be 13,575 lbs., whilst the friction, which could not average less than 5 lbs. per ton, would increase the amount to 17,575 lbs., or to more than two-fifths of the weight upon the driving-wheels.

In making a series of trials for the New York and Erie Railway, Mr. Zerah Colburn drove a train of eighty wagons, each on eight wheels, weighing with the engine and tender 1,270 tons, up a continuous incline of 1 in 480, with curves of 1,145 feet radius. The gravity being 6,000 lbs., and the other resistances 8,300 lbs., the entire resistance was 14,300 lbs. The weight on the driving-wheels of the engine, at rest, was 40,500 lbs.; hence the adhesion was 0·35 of the insistent weight.

An engine, when on a severe incline, changed its position so much as to alter materially its running condition, which should be provided for, in building engines expressly for working inclines.

It was stated that, at the time of construction of the Mountain Top Incline, it was found necessary to place a tank on the eastern slope, on a gradient of 1 in 18·87. During the first two or three summers, the ascending trains were in the habit of stopping daily, and the engines were able to start again without difficulty. There was one engine on the mountain on eight wheels, all coupled; the cylinders were 18 ins. in diameter, with a length of stroke of 22 ins.; the wheels were 3½ feet in diameter, and the gross weight of the engine was 27 tons. This engine had crossed the mountain six times in one day, with a load of 49 tons each time; making the trip in one hour from Turntable to Greenwood, and in one hour and a quarter from Greenwood to Turntable; although it was very rigid and was not adapted to the curves. One of the lighter engines had taken a load from Turntable to Greenwood in half an hour. Mr. Ellet had published a statement of the cost of working, based on the fuel and oil consumed, and the wages of the workmen. Fuel on the mountain cost two dollars per cord. It was difficult to make a just comparison of the various fuels, and to obtain correct information as to the water evaporated. The same cause that prevented the experiments on the resistance of curves, prevented comparative experiments on fuels, and accurate statements of the water evaporated. At first pine was used, but oak had been extensively adopted latterly. The effective pressure of the steam, above that of the atmosphere, usually amounted to from 100 lbs. to 120 lbs.

It was remarked, that, whereas on most English railways the results of experience showed a resistance of 12 lbs. per ton gross on a level, yet some of the statements which had been made as to the working of railways in the United States, seemed to indicate a resistance of not more than 5 lbs. per ton gross, after allowing for gravitation on the incline; whilst the permanent way of American lines was notoriously inferior in all respects to that of the English lines. The first of the results named in the paper showed a traction resistance of about 150 lbs. per ton gross. In contrast with this it was stated, that on the Great North of Scotland Railway, near Aberdeen, the Kitty Brewster incline of 1 in 59, and full of quick curves, had been worked for the last three years by two tank locomotives, having cylinders 15 inches diameter, with a length of stroke of 24 inches, and four wheels coupled, each 4½ feet diameter, at a steam pressure of 150 lbs., the load on the driving wheels being 15 tons, on the leading wheels 10 tons, and the gross weight, in working order, 25 tons. The trains were started from the foot of the incline. One of these engines could take up nineteen wagons weighing, when loaded, about 11 tons each—making a total gross weight of train behind the engine of 200 tons—at 10 miles per hour. The greatest load that had been taken was twenty-one wagons of a gross weight of 230 tons, at 5 miles per hour. The average ordinary train taken up the incline consisted of eighteen wagons, each weighing 8 to 11 tons gross; the total weight being, say, 160 tons gross, at 10 miles per hour; but excursion trains of loaded carriages, weighing when empty, 5½ tons each, and 7½ tons when loaded, making a gross load of, say, 200 tons, had also been taken up. The resistance of the train, indicated on the piston, after allowing for gravitation on the incline, amounted to 13 lbs. per ton gross, of engine, tender, and trains, which contrasted favourably with the estimated traction-resistance of 150 lbs. per ton gross on the American incline.

With reference to the influence of curves upon resistance, it had been found that at a speed of 45 miles per hour, the traction-resistance was greater by 20 per cent., on a line having curves under one mile radius, at the rate of one curve in 2½ miles, than on a practically straight line.

It was remarked, that the Whitstable Branch of the South-Eastern Railway, on which there was a gradient of 1 in 30, had originally been worked by stationary engines and rope traction; but, as the traffic was intermittent, it had been determined some years ago to substitute locomotive power, and this application had been quite successful. Bury's four-wheel coupled en-

gines, having cylinders 14 inches in diameter, with a length of stroke of 24 inches, the wheels being 4 feet 6 inches in diameter, were still in use on this branch. Four trucks of coal were taken up the incline of 1 in 80, the gross weight, including the engine and tender, being about 50 tons.

On the Folkestone Branch of the same line, which had an inclination of 1 in 30, for upwards of three-quarters of a mile, four-wheel tank engines, constructed on Mr. Crampton's plan, were employed. The four wheels of 4½ feet diameter were all coupled; the cylinders were 16 inches diameter, with a length of stroke of 24 inches; the weight of the engine was 26½ tons, and the pressure of the steam was 120 lbs. per square inch. These engines had taken up the incline a load of fourteen carriages, equal to a gross weight of 100 tons, including the engine.

It was believed that the peculiar construction of the engines and carriages in the United States, tended to lessen the resistance of curves. It was well known that in New York, and in other American cities, the railways were brought into the streets, horse-power being then employed, and that the trains were conducted round the turnings of streets with great facility. As to the cost of construction of American railways, it appeared from official returns which had been carefully compiled, that in the State of Massachusetts the cost of the principal lines had amounted to £10,599 per mile, or £9,489 per mile exclusive of rolling stock. In the State of New York these figures were respectively £11,200 and £9,762 per mile. It should be stated that a large proportion of the American railways consisted of a single way, and that their cost ranged between £5,000 and £14,000 per mile.

The Manchester, Sheffield and Lincolnshire Railway, with a gradient of 1 in 130 for upwards of 22 miles, was mentioned as a case of a main trunk line, upon which there was a large traffic, necessitating the employment of heavy engines. Ordinary inside-cylinder engines were employed, the cylinders being 18 ins. in diameter with a length of stroke of 24 ins., the wheels being 5ft. in diameter, all coupled. They weighed, when in working order, 31 tons, were worked at a pressure of 130 lbs. to the square inch, and would draw a load of forty wagons, weighting 130 tons, independent of the weight of the engine and tender.

The great feature in the paper under discussion was thought to consist in the statement, that two-fifths of the weight of the engine had been obtained as adhesive capability; whereas in this country, one-fourth had been considered as much as could be relied on, in all states of the rails. On the West Cornwall Railway, loads of about 13 tons had been conveyed up an incline of 1 in 13, for a distance of from a-half to three-quarters of a mile. The engine had four wheels coupled, and cylinders 13 ins. in diameter. This plan had been considered preferable to the employment of stationary power. On the South Devon line there were gradients varying from 1 in 41 to 1 in 51, with S curves of 15 chains radius. As a practical fact it might be recorded, that the engines would take seven loaded wagons up an incline of 1 in 41 on straight portions of the line, but when they came to curves of 15 chains radius, one of the wagons had to be removed.

It was stated, that on the Lickey incline of 1 in 37¾, an engine had been allowed to attain a speed of 30 miles in descending, and it was then brought up in 30 seconds by the application of a peculiar kind of break to the wheels of the engines.

With regard to zigzag inclines, for traversing mountains, it was stated, that the late Mr. George Stephenson had suggested their adoption, thirteen years ago, on a line in Spain. Mr. Drane had also recommended, that this method of crossing high mountains should be adopted in Ceylon. And more recently, as was well known, Mr. I. J. Berkley, M. Inst. C.E., had carried out the system successfully, on the Great Indian Peninsular Railway, for ascending the Bhore Ghaut. It was thought, that they were only desirable under special circumstances, and in peculiar positions, where it was impossible to make a continuous line, except at great cost, or by the introduction of excessively sharp curves.

Probably the steepest gradients in this country, over which a large traffic was conveyed, were on the line between Manchester and Oldham, a distance of seven miles. For a mile and a quarter there was an inclination of 1 in 48 or 1 in 50. The line was then tolerably level, until on approaching Oldham, gradients of 1 in 30 and 1 in 39 were encountered; and for about a mile and a quarter 1 in 27. This latter incline had originally been worked by stationary power and rope traction; but above five years back, the locomotive had been substituted, and no difficulty was found in taking up considerable loads.

In closing the discussion, the circumstances under which steep inclines could with propriety be adopted, were considered, and it was remarked that, as a mechanical question, there was no difficulty in apportioning the power of the engine to the amount of adhesion required to traverse a particular gradient. But inclines of 1 in 10 or 1 in 17, or even 1 in 40, would only be resorted to from necessity, at such gra-

dients were attended with a heavy cost for working expenses. On a branch of the Stockton and Darlington Railway, where there was an exceptional gradient of 1 in 40; although the traffic was all down-hill, the whole of the receipts of that portion of the line, taken at one penny per ton per mile, were absorbed by the working expenses. If the loads had been up-hill, it was believed that the working expenses alone would have amounted to threepence per ton per mile, and with gradients of 1 in 17, it was thought that this must reach one shilling to eighteen-pence per ton per mile. In fact, it was questionable, under such circumstances, whether horse-power and carts would not beat the locomotive, in point of economy, though, of course, on a long line of railway, it would be most undesirable to introduce a break of gauge. It was undoubtedly more economical to employ locomotive power on the Whitstable branch, where the amount of traffic was so inconsiderable; on the Oldham incline, the necessity of preserving an unbroken communication was a justification for the use of the locomotive, the cost of which, in such a case, must be considerable. On the incline of 1 in 26 near Liege, a perfect system of stationary engines had been in use for many years. The Belgian Government, feeling the inconvenience of that system, had abandoned it, and substituted the locomotive; but such was the uncertainty of the power, in meeting the inequalities of the incline, that the stationary engines had been again resorted to.

THE SUPERANNUATION OF DOCKYARD OFFICERS.

A CIRCULAR letter was last week issued by the Secretary of the Admiralty to the various naval establishments, to the following effect:—

"I am commanded by my lords to inform you that officers and others of seventy years of age and upwards, whose names were forwarded to the Admiralty under the circular order of the 1st of September, are forthwith to be superannuated in conformity with their lordships' decision communicated therein. In communicating these instructions my lords desire me to express their satisfation in informing you that on their lordships' representation to the Queen in Council of the disadvantages under which officers belonging to the several naval establishments have hitherto laboured on retirement from the service in consequence of age and infirmity (from the operation of the scale of fortieths in the calculation of their retiring allowance, in respect of time served on salary of less than £200 a-year, and on day-pay as workmen prior to being placed on salary), Her Majesty has been graciously pleased, by an order in Council of the 1st inst., to sanction the abolition after that date of the scale of fortieths, in all cases alike of officers retiring on salaries of more or of less than £200 a-year. In future, therefore, on the superannuation of an officer on salary (including those now about to be superannuated under the circular order above referred to), retiring allowances will be calculated entirely upon the scale of twelfths, under the Superannuation Act, for the whole period of an officer's service, excepting only the time served as an apprentice, whereby the officer, both superior and inferior, belonging to Her Majesty's dockyards, victualling yards, and other naval establishments, will henceforth be placed upon an equality as regards the principle on which their pensions will be calculated with the other civil servants of the Crown.

"I am further to inform you that Her Majesty has moreover been pleased to direct, by the same order in Council, that the time served by extra or temporary clerks, at a daily or weekly rate of pay, prior to their being placed upon the establishment on salary, shall be allowed to reckon for superannuation in the same manner as time or day pay is allowed to count for services in the cases of officers of the naval establishments referred to.

"H. CORRY."

The claims of the dockyard officers have thus been attended to before the assembling of Parliament, as we predicted they would be. A bill replacing the scale of twelfths by a scale of sixtieths will, in all probability, be passed next session, and then all that can be desired by these officers will be accomplished. But what of the dockyard men? Are they beneath the consideration of a Tory Government? Are they not to expect simple justice? We shall repeat these questions at greater length shortly.

LAW AGAINST AGRICULTURAL STEAM ENGINES.—At the annual meeting of the Sturminster Agricultural Society, held on Thursday, Dec. 2nd, the Vice-Chairman, Mr. James Harding, called the members' attention to the law against steam-engines being used within twenty-five yards of a highway, observing that with the introduction of the steam-plough and the use of the thrashing-machine it would be impossible to avoid infringing the statute, as there was scarcely one rickyard or "barton" in a hundred that was over that distance from a public road.

NORTON'S REGISTERED MANTILLA SAWL.

Court of Queen's Bench, Westminster, Dec. 4.

(Sittings at Nisi Prius after Term, before Lord Campbell *and Special Juries.)*

NORTON V. NICHOLLS AND OTHERS.

Mr. Knowles and Mr. J. H. Brewer appeared as counsel for the plaintiff; and the Attorney-General, Mr. M. Smith, and Mr. Webster for the defendants.

This was an action for the infringement of a design of a shawl registered by Mr. Joseph Norton, of Clayton West, near Huddersfield, as the "mantilla shawl." The defendants, Messrs. Nicholls, Gow, and Morris, of Glasgow, denied that the article manufactured by them was any infringement, and alleged that there was no novelty in the design of the plaintiff.

After a long trial counsel upon both sides agreed to the facts, that Norton's mantilla shawl was a new combination of old ingredients, and that, with the exception of a difference in the pattern of the border, defendants' shawl was identically the same.

Verdict for the plaintiff, with leave to the defendants to move the full Court on points of law.

TATLOCK'S SUBMARINE TELEGRAPHS.

To the Editors of the Mechanics' Magazine.

Gentlemen,—I regret that the use of the expression "induced current" in the description of my patent, should have led you to suppose that I thought a "secondary" current was induced by the primary one in a submarine cable, and was the cause of the effects I proposed to obviate. The expression, no doubt, is inaccurate; but, what I meant is clearly the same as your explanation, as you will perceive, upon perusing the second and third sentences of my description.

The cables would be laid at such a distance that no inductive effects would be produced, such as are manifested when two wires are laid side by side and within a very limited distance.

You seem to assume that Mr. Hearder's process of insulation would be necessary, even if my plan were adopted. But this is clearly not so; and I venture to assert that, with a metallic circuit, insulated in the ordinary way, no effects of the induced charge would be manifested. A cable submerged in water bears a strict analogy to a Leyden phial. It is well known that to discharge a Leyden phial, a communication must be made between the inside and outside coatings of the surfaces, which are oppositely charged. The equilibrium is thereby restored. Now, in the present system, such a communication always exists between the *inside and* outside of the cable or phial. But, by adopting the plan I suggested, no such communication can, by possibility, take place, for the *inside* of the phial (or cable) is thoroughly insulated from the *outside*. The charge would be induced, no doubt, but the *effects* of the charge would not be manifested; and the effect would, in fact, be this—that whereas, in the present system, a circuit is formed by the inside *and* outside of the charged Leyden jar, in the system I proposed, the circuit would be formed by the *inside* of the Leyden jar, *solely*.

Since the date of my provisional protection, Dr. Joule has suggested the same improvements for doing away with the effect of the "earth current;" and no doubt it would have this effect, at all events to a very great extent, for the reasons I have stated.

In your Magazine of September 4th, I see there is another cable laid between this country and Holland, so that the plan might be practically tested on that line.

Since I last wrote to you, I am informed in the *Engineer*, that the plan I proposed is not novel, but had been suggested many years ago; and that a patent for a similar invention was taken out in 1855 by Mr. Gordon, and described in your Magazine, vol. lxiv., page 424. I was not aware of this when I forwarded the description to you. At all events, whether my patent will be valid or not, I hope the plan will be practically tested, which never has, so far as I can learn, been done. Probably the engineer of the International Telegraph Company would make the experiment, if you suggested its desirability. Apologising for the length of my letter,

I am, Gentlemen, yours, &c.,
John Tatlock.

Chester, Dec. 4, 1858.

A FEW HINTS ABOUT THE ATLANTIC TELEGRAPH.

There is to be found in "Rees's Encyclopædia," published 1819, under the head "Voltaism," the following very instructive and interesting experiment:—

"Let the wires of a galvanic battery be made to terminate in a shallow flat-bottom vessel containing pure water, about one inch and a-half from each other, and if now another wire of one inch in length be laid longitudinally between them, but not to touch them, each end of the intermediate wire, if of gold or platina, will afford gas,

that end opposite the negative wire will give oxygen, the other end of the same will furnish hydrogen; and if any number of bits of wire be placed between the principal wires, and at the same time they do not touch each other, oxygen and hydrogen will be alternately furnished by the ends of the wires. When the principal wires are brought nearer together, and platina wire placed horizontally between them, one side of the intermediate wire will furnish oxygen, the other side hydrogen. This fact is put in a more striking point of view by placing a plate of platina in a vessel of pure water edgeways, and bringing the wires of the battery opposite each other, and perpendicular to the sides of the plate. If the battery employed consists of fifty plates of three inches square, a circular spot will be observed on each side of the plate opposite the wires. This appearance is caused by the evolution of gas from those parts of the plate only. It is singular that in all the experiments when the connecting wires were immersed in the water, if any substance capable of increasing the conducting power of the water be very gradually added to it, the gases given out by the intermediate wires will diminish until they entirely cease to be produced. The wire which was transversely placed, sooner ceased to afford gas than when it was in a longitudinal position, and the effect sooner ceased with the wire than with the plate. If the plate, however, be placed so as to divide the vessel into two portions and the edges so completely cemented to the side of the vessel that no liquid communication between the two portions can exist, then, whatever may be the conducting power of the fluids, the decomposition of the water takes place and gas will be produced."

The writer of the article observes, that these experiments go to prove that a fluid conductor is much better than a metallic one; most assuredly, however, this is not the case, and the experiments can be explained on a more rational principle.

Dr. Faraday discovered the great disproportion that exists between the large quantity of electricity required to decompose a very small portion of water and the quantity of gas generated, and if this were not the case, we should this day employ that subtle fluid in a better and more general way than by making it a messenger to deliver our messages. The explanation, therefore, is very simple: the pure water in some degree confines the electricity to the points of the metal wires and the platina plate, and prevents, in a great degree, any portion of it dispersing and passing away round the plate, which it does when a salt or any conducting substance is present in the water. But pure water itself is a conductor of electricity, and hence it is that so large a battery in this experiment is required, for if you bend a glass tube of small bore into a V shape, with the legs up, and fill the same with pure water, and put the ends of the wires from a battery of ten plates down the legs near to the bottom, more gas will be then obtained than was produced with the powerful battery of fifty plates, the glass insulation preventing the dispersion of the electricity. Many other interesting experiments may be made with this instrument, but the one most worthy of notice for my purpose is this: one of the wires of the battery was ten or twelve yards long, and cut into two parts in the middle; to the two ends thus separated two copper plates were soldered, and the plates sunk into moist earth a short distance from each other. With this arrangement the battery was put into action, but no gas was produced; but when the plates were taken out, the earth cleaned and pressed together, then the action proceeded as before, and gas was produced. It does not follow that because no decomposition of the water took place when the moist earth formed part of the circuit, therefore no electricity passed through the apparatus; on the contrary, a galvanometer placed in the circuit proved, by the great deflection of the needle, that a large quantity was in motion, although not sufficient to produce gas.

This instrument, therefore, is a very delicate instrument to make sensible the peculiar action, when in motion, of this wonderful agent, and the necessity there is in long submarine telegraphic lines to be careful to have no portion of the circuit composed of an imperfect conductor. This reasoning is strengthened and confirmed in a great degree by an ingenious experiment performed by the late Sir Humphry Davy (Davy's "Chemical Philosophy," page 150, published 1812):—Let two platina wires, from the extremity of a battery composed of plates one foot square, be placed in water; the quantity of water disengaged from the plates will be the same nearly as from a battery of an equal number of plates one inch square. Let the fingers of each hand moistened with water be applied to the two extremities of the battery, and a shock will be perceived nearly the same as if there were no connection between the wires and the water. Whilst the circuit exists through the human body, and through water, let a wire, attached to a thin slip of charcoal, be made to connect the two ends of the battery; the charcoal will become vividly ignited, the water and the animal substance discharge the electricity of a surface probably not superior to their own surface of

contact with the metals. The wire discharges all the residue electricity of the plates, and, if a similar experiment be made on the plates of one inch square, there will be scarce any sensation when the hands are made to connect the ends of the battery, a circuit having been previously made through water, and no spark when charcoal is made the medium of communication, imperfect conductors having been previously applied. All these experiments go to prove that in reality it is that portion of the circuit traversed by the electricity which is the most imperfect of the conductors that governs and controuls the quantity of electricity which is put in motion, and that it does not signify what the power of an instrument for generating electricity at Valentia may be—no more can be sent forward to Halifax by the cable, no matter how perfect the conducting wire be, or the construction of the cable, than what the imperfect conducting substance, the moist earth, will take up and send in the same direction to Halifax; therefore, there need be no apprehension that the powerful instruments made use of can have done the least injury to the cable, wire, or the insulation. The conclusion I wish to come to is this :—in all long submarine telegraphic lines give the electricity fair play, let it have a good metallic road throughout, loosen the girths and let go the reins; no matter what may be the distance, Morse's instrument will receive and print the message. That this assertion is not exaggerated is proved by the fact that, with a bad road, one half it being moist earth, the other half a cable, in my opinion not constructed on the best principles, a message has been sent a distance of two thousand miles; but so exhausted was the courier in performing it, that it required one hour to deliver the message, and what was more inconvenient, it required what may be called a microscopic instrument to detect the signals and read the message, and has since been overpowered with the exertion.

I had some more observations to make, but this letter has already exceeded in length what I purposed sending, and I shall take another opportunity.

I am, Gentlemen, yours, &c.,

P. M.

The Ships of the Royal Navy.—A paper "on the modifications which the ships of the Royal Navy have undergone during the present century in respect to their forms, dimensions, means of propulsion, and powers of attack and defence," will be read at the Society of Arts, Adelphi, London, on Wednesday evening next, by Mr. E. J. Reed, one of the Editors of this Magazine.

SUBMARINE TELEGRAPHS.

Gentlemen,—I observed in your last number your notice of Mr. Tatlock's "Improvements in Submarine Telegraphs," and quite agree with you that his arrangement will not produce the effect intended, and even if it would, I think I recollect a patent taken out some time ago for the same thing. I conceive, however, that the difficulty mentioned may be easily and certainly overcome as follows. After a submarine cable is laid, and found to be properly isolated, and that the best number of cells for working it has been ascertained, suppose twenty-four pair for example, let the current proceeding from the discharge of the insulating material be accurately measured, and it will be found to be equal to that proceeding from some smaller number of cells, say six pair for example. All that is now necessary to prevent any evil from this second current is so to arrange the apparatus that any pulsation sent, whether positive or negative, from the twenty-four-cell battery, should be instantly followed by one of the same duration of time, but of an opposite polarity, from the six-cell battery. This, of course, would not be felt at the other end, as it would only exactly neutralize the current from the absorbed charge, and would render the action of the telegraph as rapid as if on land.

I am, Gentlemen, yours, &c.,

Wm. H. B.

P.S.—It might be found in practice that it was the quantity, and not the number of cells, that required diminution.

ELONGATED PROJECTILES.

Gentlemen,—When, in the summer of 1823, I stated to the Select Committee of Artillery officers, at Woolwich, that I had frequently, at the distance of 12 yards, pierced a brass plate, of about the thickness of a shilling, with an arrow or dart having its shaft formed of a steel knitting-needle, and its lower or inner end of elder pith, after the manner of the dart that is used by the Malays for blowing through a tube of about 6 ft. in length, but that the dart only pierced the plate when it struck it direct, without any obliquity, Colonel Miller, one of the members, said to me, "Mr. Norton, you make experiments for your amusement, and then you come before us to know our opinion about them;" I replied, with surprise and emotion, "I do; and if by my amusement I can add power to the arms of England, I shall be proud and happy for it." My present improved elongated projectiles for fire-arms is derived from the expanding action of the plastic lotus pith placed on the inner end of the

tube dart. In the autumn of 1823, being on leave of absence in Ireland, I presented the Malay tube, with its quiver of darts, which was given to me at Bangalore, in 1818, to the museum of the Royal Society in Dublin, prescient of their teaching. Please add the enclosed summary, and oblige Yours, &c.,

J. NORTON.

Rosherville.

SUMMARY.

In the year 1818. The expanding of the hollow plastic pith base of the Malay tube-arrow by the force of the collected breath of a practised person, so as to fill the interior of the tube, suggested to me that an elongated shot of plastic lead would also expand by the force of the gas of exploded gunpowder, so as to fill the interior of a gun barrel, and thus prevent loss of power by windage, or the escape of a portion of the gas between the shot and interior of the gun barrel.

In 1821 I discovered that the spherical ball of a rifled air-gun loading at the breech, always struck the object with the *same point* it presented when lying in the breech of the barrel.

And in the year 1823. I applied this discovery to the formation of a rifle percussion shell, and elongated expanding shot. J. N.

3rd Dec., 1858.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

PRICE, A. P. *Improvements in the treatment of certain zinc ores and compounds of zinc, and in the manufacture of zinc and oxide of zinc.* Dated Apr. 16, 1858. (No. 828.)

The object here is the treatment of the ores, whether calcined or oxidised, or artificially prepared, or of manufactured oxides of zinc, when occurring in a finely-divided condition, and especially of those oxides which result from zinc ores that have been subjected to a process of calcination or oxidation, such as calcined or oxidised blendes, in order that zinc, or oxide of zinc, may be obtained therefrom in a cupola, blast, or other furnace. The ores, having been reduced to a fine state of division, are mixed with bituminous coal, or coking coal, &c., and subjected to the action of heat in a partially closed distillatory apparatus, so that a coke may be obtained. The invention also consists in combining and mixing such ores when in a state of division, with fluxes suitable to effect the fluxing of the residual earthy and other matters contained in the ores with bituminous coal, &c., which may be necessary to form a coke or coked material when subjected to a coking, heating, or distillatory process.

PRICE, A. P. *Improvements in obtaining cadmium, and certain compounds thereof.* Dated Apr. 16, 1858. (No. 829.)

These consist in subjecting certain ores containing cadmium to calcination in a calcining furnace in contact with air, so that the sulphuret of cadmium may be entirely or in part converted into sulphate of cadmium, and the other metals into sulphates or oxides. The sulphate of cadmium thus formed may be dissolved out by water, and the cadmium may be separated by metallic zinc, or sulphuretted hydrogen. Should the solution contain silver or copper, these may be precipitated by metallic iron. They further consist in subjecting certain sulphurets of zinc or blendes containing cadmium to calcination as aforesaid, and to what is known as the salting process, namely, a calcination with the addition of salt, or chloride of sodium, &c.

PRICE, A. P. *Improvements in the treatment and smelting of certain argentiferous or silver ores.* Dated Apr. 16, 1858. (No. 830.)

These consist in mixing silver ores when in a state of division with bituminous or coking coal, &c., and in subjecting the same to the action of heat, so as to form a coked material. Also in mixing such silver ores in a state of division with fluxes to effect the fluxing of the silver ore, and also with sulphurets of copper, iron, or lead, or sulphuretted material, when the object is to obtain the metals contained in the ore, or some of them, in a state of regulus, or with oxides or carbonates of lead, which may be mixed with, or be employed without such fluxes or sulphuretted materials, and with the bituminous coal or other materials to form a coke. Also in the employment of the result of the admixture of silver ores with bituminous materials, or with fluxes, or with sulphuretted or non-sulphuretted materials and fluxes when coked as aforesaid in a blast cupola, or other furnace, to obtain the silver or other metals, either in a state of regulus or sulphurets, in combination with sulphurets of iron, copper, or lead, or as metallic silver in combination with lead.

JOHNSON, J. H. *Improvements in preparing printing surfaces.* (A communication.) Dated Apr. 16, 1858. (No. 831.)

The patentee claims, 1. Producing printing surfaces by preparing a mould of wax which is applied to a hard, transparent, smooth, and level plate, into which mould the metal is deposited by electrical action. 2. Preparing granulated surfaces so as to produce various shades and effects in printing surfaces. 3. Producing typographic printing surfaces by impressing dies containing letters, &c., used in typography into a plate composed of, or coated with, such a substance as will readily take and preserve the impression of such dies, and allow a stereotype to be made thereof, by means of a plaster cast. 4. The combination of a rotating letter disc or series of radial arms with a sliding plate and block capable of moving laterally and longitudinally. 5. The use of the slotted bridge piece for regulating the depth of impression and guiding the die on to the required spot in the surface of the plate or coating thereof.

LUIS, J. *A new system of window frames for railway carriages.* (A communication.) Dated Apr. 17, 1858. (No. 832.)

This consists in the use of double-corner iron plates. The shafts are fastened together at the ends by cross beams, on which they are held by iron squares, and at different parts of their length by intermediate iron beams, with iron double elbow joints, which meet on the shaft held by the iron squares. The rigidity of the framework is completed by two elbow-jointed cross bars of iron fixed below all the intermediate cross beams by bolts, and which are kept on the end cross beams by screws at their ends. These pieces are bent, thus preventing a flexion that the shafts might otherwise have under heavy loads.

SANS, E. F. *Apparatus serving to measure upon a large scale the smallest pressions of any fluid matters.* Dated Apr. 17, 1858. (No. 833.)

This invention cannot be described without engravings.

GRASSAY, J. *Hangings and all sorts of paper, made waterproof by a new process.* Dated Apr. 17, 1858. (No. 834.)

The patentee coats papers with a composition formed of mineral tar, 3 parts; resin, 1 part; litharge, 1 part; hydraulic lime, 3 parts. These ingredients are mixed, reduced to a liquid, and

spread warm on the paper, which dries almost immediately, when it can be rolled up or used.

LUTEREAU, A. A. *The purpose by machinery to polish, wholly or partly, leather, paper-hangings, and all other febril stuff; that is to say, that a piece can be polished in several parts, having spaces unpolished.* Dated Apr. 17, 1858. (No. 835.)

This invention cannot be described without engravings.

GILBERT, F. C. *A disinfecting composition to purify waterclosets and all insalubrious places.* Dated Apr. 17, 1858. (No. 836.)

In a vessel containing 88 gallons of water, the patentee pours about 3 cwt. of sulphuric acid, and introduces, at the same time, about 1½ cwt. of oxide of zinc, which he can replace by the same quantity of oxide of iron. When ebullition is complete, he adds about 2½ cwt. of aluminous earth with the product of an argillaceous schistus, and then dilutes the whole with water.

CHALMERS, D., and J. T. SWALLOW. *Improvements in looms.* Dated Apr. 17, 1858. (No. 837.)

This consists, 1. In a mode of working the heddles of power looms, applicable to weaving various kinds of twilled or figured fabrics; in improvements in the mode of actuating the shuttle boxes in drop-box looms where a number of shuttles are used. These improvements cannot be described without engravings.

CHIRM, J. R., jun. *A new or improved chimney pot or top.* Dated Apr. 17, 1858. (No. 839.)

The patentee describes a chimney pot, the upper parts or the whole of which has the figure of a three-sided prism, each of the sides being bevelled off so as to present a termination of the form of two sides of a triangle, or have an ornamental figure such as may be cut from or inscribed within two sides of a triangle.

CARRON, W. *Improvements in constructing moulds for casting nails, spikes, and bolts.* Dated Apr. 17, 1858. (No. 840.)

This consists in constructing moulds for casting nails, spikes, and bolts, by moulding the two sides of the mould upon the opposite sides of a pattern plate, having a portion of the pattern nail, spike, or bolt on the one side, and the other portion of the pattern nail (spike or bolt) on the other side; or using two pattern plates having the two portions of the nail fixed thereon respectively, the said portions being such as would be produced by dividing the nail in a plane in its axis or parallel to its axis. There are several modifications included.

HAWKER, C. *An improved manufacture of cartridge for fire-arms.* (Partly a communication.) Dated Apr. 17, 1858. (No. 844.)

The patentee provides a cylindrical former with a recess at one end, of a conical or spherical form, to correspond with the shape of the ball. Around this former he applies a strip of sheet gutta percha, to form a water-tight tube. The sheet he cuts into strips for making a case, and these he laps round the former, securing the overlapping edge by moistening it with a cement. These pieces of tube he closes at one end by cement, moulding that end at the same time so as to form a seat for the spherical ball, &c. He then inserts the powder at the open end, and closes the edges with naphtha or other solvent. The ball is attached to the moulded end of the case by lapping over the ball canvas, tape, or fibres, which he cements to the case.

JOHNSON, J. H. *Improvements in sewing machines.* (A communication.) Dated Apr. 17, 1858. (No. 845.)

This invention cannot be clearly described without engravings.

LUCK, T. *Improvements in machinery for raking and seeding land.* Dated Apr. 17, 1858. (No. 846.)

Here a horse rake, consisting of a series of independent curved tines, is arranged, so that by a lever handle, the whole of the points of the tines may be lifted off or out of the surface of the land, and the framing is arranged to receive a seed box so that it may be lifted out of its position, together with the seeding coulters and tubes connected therewith, when it is desired to use the horse rake separately. The coulters act in lines parallel with the tines and in advance of them. The coulter tubes are as numerous as the tines, and the same lever handle raises the tines and the coulters. The tines may be lifted a short distance without raising the coulters, that the coulters may act when desired whilst the tines are out of action.

LATHAM, W. *Improvements in the manufacture of hats and caps.* Dated Apr. 17, 1858. (No. 847.)

Here the body of the hat or cap, just above the upper edge of the ordinary band, is made of somewhat larger diameter, and is perforated with numerous holes, so that air may enter just above where the hat or cap fits the head of the wearer.

JENNINGS, J. G. *Improvements in the constructions of sewers, culverts, arches, and other similar structures, and in the manufacture of blocks of clay, pottery, and other similar wares suitable to be used in such constructions.* Dated Apr. 17, 1858. (No. 848.)

This comprises various methods of effecting the objects mentioned in the above title. These methods cannot be described without engravings.

RIDGWAY, W. H. *Improved apparatus for opening the covers of jugs.* Dated Apr. 19, 1858. (No. 851.)

This consists in fitting the lid with an arm or lever projecting towards the handle, and having the hinge of the cover as its fulcrum. A pin passing through a socket, and being placed within easy reach of the thumb of the hand which holds the jug, bears upon the arm or lever.

BULLOUGH, W., and J. HARRISON. *Certain improvements in looms for weaving, and in machinery for winding the cord used in the manufacture of weavers' healds.* Dated Apr. 19, 1858. (No. 852.)

This is applicable to those looms in which a box containing two or more shuttles is employed, and it consists in improved combinations of machinery for moving the box containing the shuttles so as to bring either shuttle when required in a line with the shuttle race. For winding the cord used in manufacturing weavers' healds, the spindles of such machines are made to fit both the bobbins and pirns. The shaping rail is made to move from one level to another, so as to wind the cord either in bobbins or pirns.

EDWARDS, H. *Improvements in trousers or other similar articles of wearing apparel.* Dated Apr. 19, 1858. (No. 854.)

These consist in constructing trousers, &c., with a horizontal, vertical, or diagonal opening in the seat, which aperture is made self-closing by elastic bands, gores, or gussets. The invention will be found of great service to railway travellers and invalids, the object being ready means of adjustment.

HENRY, M. *Improvements in the manufacture of candles, and in preparing materials for the same, and in apparatus employed therein.* (A communication.) Dated Apr. 19, 1858. (No. 855.)

This cannot be described without engravings.

CALVER, C. K. *Improvements in the formation of harbours of refuge, which improvements are also applicable as a wave screen in other situations.* Dated Apr. 19, 1858. (No. 857.)

See *Mechanics' Magazine*, pages 147 and 174 of current volume.

ARMSTRONG, J. *Improvements in apparatus used for preserving timber.* Dated Apr. 19, 1858. (No. 858.)

This consists in mounting vessels and apparatus such as have been heretofore used for impregnating timber under pressure, on carriages or wheels suitable for running on railways, or on common roads.

CLARK, W. *A new instrument for taking the altitude of the sun, to be termed the helypsometer.* (A communication.) Dated Apr. 19, 1858. (No. 859.)

The main object of this invention is to enable the altitude of the sun to be taken when the natural horizon is obscured. The instrument consists of two parts, one of which is used to record the action

of the sun's rays upon a sensitive coating similar to that employed in photographic processes, and the other to measure the altitude thus recorded. The first portion consists of a hollow hemisphere. Its equatorial plane is kept in a horizontal position, and has a small orifice in the centre. Its concave surface is prepared with a sensitive coating. The rays of the sun, being admitted through the orifice above mentioned, produce a mark upon the sensitively-prepared concave surface, and by applying the measuring portion of the instrument to measure the distance in degrees of a circle from the equatorial plane of the hemisphere, the altitude is obtained, being represented by the said distance in degrees.

DEROGY, E. *Improvements in instruments and apparatus applicable to photographic purposes.* Dated Apr. 20, 1858. (No. 860.)

This consists of a new system of mountings for optical instruments and apparatus for obtaining photographic representations, such mountings and apparatus having the form of a tube, into which are fitted divergent and convergent achromatic lenses, and which is screwed to the front of the camera obscura. This apparatus is so contrived that the patentee obtains the same results in taking portraits, &c., as are obtained by the use of at least three separate instruments, or sets of apparatus, that is to say, with the apparatus constructed on a 3-inch scale, he obtains productions of the same size as are now obtained with a 4-inch apparatus; he also takes portraits, &c., either on a larger or smaller scale, by lengthening or shortening the focus. The views are taken instantaneously.

WHITELEY, J. *An improvement in machinery for the manufacture of looped fabrics.* Dated Apr. 20, 1858. (No. 861.)

This consists in a combination of needles or hooks and grooved points for pressing off the loop, whereby pressers and presser bars are dispensed with. The patentee makes his needles to terminate in short rigid hooks, but they have a groove, and are similar in other respects to ordinary needles. He causes the grooved points to slide forward within the loop resting upon the groove in the needle and on under the rigid hook, the end of the hook entering the groove in the point whereby the thread is guided over the point of the hook and off from the needle; suitable motions being imparted to the needles or points, or both to needles and points. The thread is laid on the needles in the usual manner.

PEACOCK, R. *Improvements in apparatus for preventing smoke in furnaces, and in effecting a more perfect combustion of fuel.* Dated Apr. 20, 1858. (No. 864.)

This consists of a self-acting and self-regulating furnace-door valve, in the form of a sectional screw-bladed disc, for regulating the supply of atmospheric air to furnaces at the various periods after coaling.

FINLAYSON, G. *Improvements in machinery or apparatus for sowing or depositing seeds in land.* Dated Apr. 20, 1858. (No. 865.)

This invention relates to so arranging seed-sowing apparatus, that whilst the weight of the seed box or trough and appurtenances is retained in a vertical line with the centre of the axles and carrying wheels, the box or trough is kept low down so that the seeds are deposited with great certainty, by passing the seed box or trough directly through the centres of the carrying wheels, or otherwise so disposing the box that its longitudinal axis shall coincide, or nearly so, with the horizontal axial line of the wheels.

SMITH, J. B. *Improvements in adjusting the position of pendent and other lamps.* Dated Apr. 20, 1858. (No. 866.)

This is mainly intended as a substitute for the hydraulic tubes, balance weights, &c., which have hitherto been employed, and which, by their weight, or by the repeated breaking of the chains, have always been liable to failure. The improvements cannot be described without engravings.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

BANCROFT, G. W. *Improvements in the construction of certain parts of railway carriages, to ensure safety in travelling.* Dated Apr. 17, 1858. (No. 838.)

This consists in fixing to the ends of the carriages a metal box open at one end, and having at top a cylinder slotted at one side, through which a lever works on a short axis within the cylinder. The connexion between the boxes of two carriages abutting on each other is made by placing within the end opening of each box a grooved metal plug, such plugs being coupled in pairs by chains. The lever is then raised vertically, causing its lower end to enter the groove in the plug and prevent its withdrawal. Within each carriage, immediately under the roof, and passing out before and behind, and between small pulleys, the inventor affixes a leather strap, and supports it by small hangers, and attaches to the external ends of each strap a metal spring catch, so as to attach the straps of the several carriages. The alarm may be given at each end of the train by bells, gongs, &c. He supplies each carriage with brake blocks fitting on the top edge of the wheels, and connected in pairs with a horizontal shaft worked from above by vertical racks operated by side levers and short racked levers, worked from underneath the carriages by jointed connecting rods, under the direction of the guard.

WESTHEAD, M. B., and H. BAINES. *Certain improvements in machinery or apparatus for the prevention of accidents, applicable to hoisting and other lifting machines employed in connection with railways or other places where heavy bodies require to be moved from one level to another.* Dated Apr. 19, 1858. (No. 849.)

This relates to machinery by which railway wagons, &c., are moved from one level to another, and consists of levers actuated by weights or springs for preventing them from moving off the platform of hoists during the ascent or descent thereof, and also in arrangements which will prevent them from being run into the hoist shaft till the platform is in position to receive them. It also consists of levers which are pressed against the ropes or chains suspending the platform by weights or springs, so that when a rope or chain breaks they allow the weights or springs to bring into operation mechanism that disconnects the driving apparatus and applies the brake to prevent the descent of the platform.

DRAKE, J., jun. *Improvements in sewing machines.* Dated Apr. 19, 1858. (No. 850.)

These consist in the use of a hollow needle for supplying the under thread to ordinary sewing machines, or a tube with one end made up solid and pointed, the other end having a lid screwed thereto, so as to be readily removed and re-attached. The needle is of sufficient interior capacity to hold a small cop of thread, so that the thread can be drawn out through a hole in the lid. The needle is bent into a segment of a circle. Also, in the use of a circular plate with a circular groove formed in one side near the outer edge, of a size to receive the curved needle, or to allow of its being imbedded therein, so as to be capable of sliding freely in the groove.

HOWARTH, J. *Improved apparatus to facilitate the discharge of smoke and prevent its return, which said apparatus is also applicable for the ventilation of buildings.* Dated Apr. 19, 1858. (No. 853.)

This apparatus consists of an exterior casing of metal, within which is supported a central vertical spindle, upon the upper extremity of which is placed a cap which may be conically shaped, and having curved or spiral openings at the sides for the discharge of smoke when employed at the top of a chimney. Upon this central spindle, and within the casing at a point about the middle of its length, a conical and spirally leaved vane is placed.

CLARK, W. S. *A nautical safe and life preserver.* (A communication.) Dated Apr. 20, 1858. (No. 862.)

This consists of a globular vessel of metal divided into compartments by decks provided with hatchways and doors, which are made water-tight, and secured with straps, staples, and locks, so that treasure may be placed in the lower compartments, while the upper portion will be empty, and thus give it the necessary buoyancy. The main hatchway and door, as well as the decks, have grummet rings and packing of gum elastic, while by suitable locks robbery is prevented. The safe has a fog bell suspended from a removeable gallows frame, and also a flag-staff and signal. The upper half of the globe being rendered bright by tinning, the safe in the water can be easily seen.

CLARK, W. S. *An improved cultivator tooth for agricultural purposes.* (A communication.) Dated Apr. 20, 1858. (No. 863.)

These consist in forming a sheet metal cultivator tooth with a hollow shank, upon which a screw thread is cut, by which it can be fastened to the frame by a nut, the shank for this purpose being passed through a mortice formed in the frame of the machine. In forming the tooth, it is first cut out of a sheet of metal, then swaged into shape, the shank bent into cylindrical form, and a screw thread cut upon it.

LEADBETTER, J., and G. TERRY. *Improvements in the manufacture of metallic trunks and other receptacles for property.* Dated Apr. 20, 1858. (No. 868.)

To give additional strength to the lids, the inventors form, on the under side of them, and in the direction of their length, ribs or flanges, by doubling the metal back upon itself. They propose, in addition to a simple lock, to apply a spring catch or catches thereto, which will hold down the lid when the bolt of the lock is thrown back.

RAWSTORNE, J. *Improved means for stopping or retarding the progress of ships or vessels.* Dated Apr. 20, 1858. (No. 869.)

This consists in the adaptation to the sides or other parts of ships of moveable pins, paddles, boards, floats, &c., capable of being either lowered into the water or opened out when required, so that they may offer considerable surface resistance to the onward progress of the vessel.

OGILVIE, A., and J. RICHARDSON. *Improvements in apparatus for working steam engines.* Dated Apr. 21, 1858. (No. 871.)

Here the working of the engine is effected by causing the steam to pass from the steam pipe through a valve, and enter a pipe communicating with the ordinary induction passages, another pipe being in communication with the ordinary eduction passages, so that by reversing the functions of these two pipes by the valve, and thereby reversing the induction and eduction passages, the steam will be made to enter and leave the cylinder by an opposite course, and thus reverse the action of the engine.

SHRIMPTON, A. *An improvement or improvements in the manufacture of metallic bedsteads, and other articles for sitting, lying, or reclining upon.* Dated Apr. 21, 1858. (No. 872.)

This consists in the use of a moveable bar of iron with studs projecting thereon, moving transversely or longitudinally upon or under the side or end rail of a metallic bedstead, &c., and in the use of spring or screw-stretchers, with the ends cut in a peculiar manner; and in the use of wedges for holding the laths tightly in their places, thereby facilitating the putting together and taking to pieces of metallic bedsteads, &c.

PROVISIONAL PROTECTIONS.

Dated September 17, 1858.

2102. C. Hadley, of Birmingham. Improvements in omnibuses, cabs, railway carriages, wagons, and other similar vehicles.

Dated November 6, 1858.

2482. A. Fryer, of Manchester, sugar refiner. An improved method of supplying the tenders of locomotive engines, and of supplying boilers with water.

2484. W. Green, of King William-st., Strand, gentleman. An improved harness trace coupling. A communication.

2486. B. D. Webster, of Penns, Warwick, and J. Horsfall, of Birmingham, manufacturers. An improvement in the manufacture of steel wire.

2488. M. Matley, engineer, H. Miller, mechanic, and T. Hall, engineer, all of Ashton-under-Lyne. Improvements in the construction and arrangement of steam boilers and furnaces for the purpose of consuming smoke, economizing fuel, and heating the feed water, and also improvements in certain valves connected with steam boilers.

2490. J. Platt, of Oldham, mechanical engineer. Improvements in machinery or apparatus for preparing, spinning, and doubling cotton and other fibrous materials.

Dated November 8, 1858.

2492. M. Osborne, of Birmingham, manufacturer. A new or improved method of ornamenting fenders, stove-grates, tables, chairs, and couches made of cast iron.

2494. A. H. Dendy, of Kentish-town, esq. Improvements in the construction of breakwaters or wave screens, applicable also in constructing bridges, roadways, piers, jetties, landing stages, and other structures.

2496. T. MacSweney, of Rood-lane. Improvements in steering apparatus.

2498. W. Smith, of Little Woolstone, Buckingham. Improvements in apparatus for supporting the hauling ropes when hauling ploughs and other agricultural implements by steam power.

2500. W. C. Cambridge, of Bristol, agricultural implement maker. An improved manufacture of tubular iron applicable to the construction of whippletrees and to other uses.

Dated November 9, 1858.

2504. J. F. Dickson, of Litchurch, near Derby, engineer. Improvements in the construction of railway chairs and other details connected with the permanent way of railways.

2508. J. Felix, of Grenelle, near Paris, mechanician. Improvements in castors for furniture and other similar purposes.

2510. W. Clark, of Chancery-lane. Improvements in signals for railways and in apparatus for actuating the same. A communication from A. L. Verité and J. S. Bazin.

2512. A. V. Newton, of Chancery-lane. Improvements in the construction of stairs. A communication.

2514. A. V. Newton, of Chancery-lane. Certain improvements in electric telegraphs. A communication.

2516. R. M. Ordish, of Great George-st., Westminster, civil engineer. Improvements in constructing the permanent ways of railways.

Dated November 10, 1858.

2520. W. G. Taylor, of Ashby-de-la-Zouch. Improvements in removing the fur from skins and preparing said skins for tanning.

2522. E. Humphrys, of Deptford, engineer. Improvements in steam engines and boilers.

2524. A. J. Brooks, of Southsea, Hants, solicitor. An improvement in screw propellers.

2526. E. Locke, of Newport, Monmouth, engineer. Improvements in the construction of gas meters.

Dated November 11, 1858.

2528. J. Blethyn, of Swansea, engineer. Improvements in the manufacture of fuel.

2530. R. Wright, of Openshaw, near Manchester, jeweller, and T. J. Mercer, jun., of Coventry, watch manufacturer. A new or improved motive-power engine.

2532. M. Benson, of Newcastle, mechanical engineer. An improved manufacture of rails for railways. A communication.

2534. T. Gray, of Bride-lane. An improvement in separating wool and animal fibres from vegetable fibres contained in mixed fabrics.

2536. A. Mickelthwate, of Sheffield. Improvements in treating and manufacturing buffalo and other horn, so as to be used as a substitute for whalebone and for other useful purposes.

Dated November 12, 1858.

2538. T. F. Cocker, of Sheffield, steel file maker. Improvements in the manufacture of steel and iron wire, also of sheets and strips of steel.

2542. G. T. Bousfield, of Brixton. An improved apparatus for illustrating conic sections and the lines of the globe. A communication.

Dated November 13, 1858.

2544. J. Benyon, of Swinton, near Manchester, manager, and J. W. B. Bowden, of the same place, manufacturer. Certain improvements in looms for weaving.

2546. W. Ashton and T. Cartmell, of Preston, engineers. Improvements in air pumps, part of which improvements is also applicable to the pistons of other pumps and of steam engines.

2550. M. Swan, of St. John's-wood, civil engineer. Improvements in the construction of floating docks and other floating structures.

2552. I. Livermore, of Dalston. An improvement in the manufacture of shuttlecocks.

2554. C. J., T., H., and C. Thomas, of Bristol, soap manufacturers. An improvement in the manufacture of caustic alkaline lees.

2556. D. Frodsham, of Stratford. Improvements in apparatus used in combination with fire boxes of tubular steam boilers in order to supply air and steam thereto.

2558. J. A. Hopkinson, of Huddersfield, engineer. Improvements in steam boilers.

Dated November 15, 1858.

2562. G. Davies, of Serle-st., Lincoln's-inn. Improvements in the process of finishing piled fabrics, and in apparatus employed in such process. A communication.

2564. W. G. Armstrong, of Newcastle-on-Tyne, civil engineer. Improvements in the manufacture of ordnance.

2566. W. Clark, of Chancery-lane. Improvements in colouring, preserving, and desiccating wood and marble, and in apparatus for the same. A communication from F. Casult.

2568. J. G. Bunting, of Saint John, New Brunswick. A mechanical horse-tamer or brake.

Dated November 16, 1858.

2570. J. H. Johnson, of Lincoln's-inn-fields. Improvements in machinery or apparatus for kneading dough or working and mixing plastic materials. A communication from Monsieur Valleé.

2574. S. Taylor, of the Temple. Improvements in fountain pens.

2578. A. M. Bruère, of Paris, gentleman. The novel application of hydrogen gas to various purposes in the arts.

Dated November 17, 1858.

2580. S. Hoga, of Nassau-st., Middlesex Hospital, W. P. Piggott, of Argyll-st., Regent-st., and S. Beardmore, of Upper Berkeley-st. west. Improvements in electric telegraphs.

2582. C. F. Vasserot, of Essex-st., Strand. A waterproof coating. A communication from L. X. Beuchot.

2584. J. H. Tuck, of Great George-st., Westminster, civil engineer. Improvements in the mode of laying and securing telegraphic cables, and in apparatus for the same, and for carrying on other operations under water.

2590. M. Caton, of Preston, overlooker. Improvements in the treading motion of looms for weaving, and also in shuttle boxes and swells connected therewith.

2592. R. A. Brooman, of 166, Fleet-st., London, patent agent. Improvements in apparatus for the manufacture of lace and net. A communication from A. Grivel, jun., and J. F. V. Mouilleron.

2594. J. Platt, of Oldham, engineer, and H. Chubb, of Camden-town, gentleman. Improvements in machinery or apparatus for making bricks or tiles. Partly a communication.

2596. H. Douglas, bart., of Green-st., Grosvenor-sq., General H.M.S. Improvements in screw propellers.

Dated November 18, 1858.

2598. S. Riley, of Oldham, stamp distributor. Improvements in the manufacture of hats, bonnets, and caps.

2599. C. Cowper, of Southampton-buildings. Improvements in assorting and separating combed fibres, and in machinery for that purpose. A communication from M. Ziegler.

2600. E. Briollet, of Torrington-sq. The obtaining of caloric by a new chemical and mechanical process. A communication from Mr. Mundo.

2601. Sir C. T. Bright, of Harrow Weald. Improvements in insulators, and an improved mode of connecting insulators to posts and other supports.

2602. J. and H. Sharp, of Bradford, York, Jacquard machine makers. Improvements in Jacquard machines employed in weaving.

2603. H. Stott, of Greetland, near Halifax, cotton warp manufacturer. Improvements in warping mills or apparatus connected therewith.

2604. J. Leslie, of Conduit-st. Improvements in the manufacture of gas.

2605. J. Oakes, of Birmingham, spur maker. Improvements in the manufacture of spurs.

2606. J. M. Miller, of Barnstaple, lace maker, and J. Fear, of the same place, machinist. Improvements in machinery for winding fibrous substances or materials when in the form of thread or yarn on to the bobbins or wheels used in lace machinery.

2607. D. Stoten, of Ponders End, blacksmith. Improvements in ploughshares.

2608. E. T. Archer, of Wandsworth, paper maker. Improvements in hat ventilators, and appliances connected therewith.

2609. B. Rider, of Red Cross-st., Boro', leather dresser. Improvements in ventilating hats and caps, and in the preparation or manufacture of the material of which those articles are made.

Dated November 19, 1858.

2611. J. Brown, of Bolton-le-Moors, iron founder. Certain improvements in index and Jacquard machines.

2613. G. Howe, engineer, and J. Norton, plumber, of Sheffield. An improved method of boiling water or worts for breweries, distilleries, &c., by steam, or for heating rooms, public buildings, churches, chapels, factories, &c.

2615. J. Edwards, of Aldermanbury. Improvements in the manufacture of trouser buttons.

2617. C. F. Vasserot, of Essex-st., Strand. An improved apparatus for condensing and cooling vapours and liquids. A communication from L. Fialon.

2619. W. Ramscar and J. G. Scott, of Manchester. Improvements in fire-arms.

2621. H. Bailey, of Golden-sq., warehouseman. Improvements in heating razors.

2623. A. Felton, of Brick-lane, Spitalfields, currier. Improvements in fastening buttons and studs to dress and other articles.

2625. W. Marshall, of Leith-walk, Mid-Lothian, engineer. Improvements in steam engines.

2627. A. J. Thorman, of Lime-st., City, ship agent. Improvements in chain cables and chains.

2629. A. V. Newton, of Chancery-lane. Improved apparatus for transmitting motive power. A communication.

Dated November 20, 1858.

2631. R. Warry, armourer sergeant, 3rd depôt battalion, Chatham. Loading cannon at the breech.

2633. C. F. Vasserot, of Essex-st., Strand. Improvements in fire-arms and ordnance, and in the projectiles to be used therewith. A communication from P. R. Smith, Paris.

2635. H. Ellis, of Holbeach, Lincoln, engineer. Improvements in machinery or apparatus for cultivating, cleaning, and pulverising land.

2637. C. Cuit, of Paris, manufacturer. Improvements in railway brakes.

2639. R. A. Brooman, of 166, Fleet-st., London, patent agent. Improvements in the manufacture of dolls, statuettes, figures of animals and others, and toys. A communication from A. F. E. Robert, of Paris.

2641. D. Evans, of New Town, Stratford. Improvements in tubular steam boilers and fire-places or furnaces used therewith.

2643. J. Young, of Wolverhampton, manufacturer. Improvements in fastenings for window sashes and casements, and in chain used in suspending window sashes.

2645. H. Boden, of Hackney, silk manufacturer, and T. Cooper, of Hackney-road, machinist. Improvements in platting or braiding machinery.

Dated November 22, 1858.

2647. C. H. Mellor, of Oldham, manager. An improved manufacture of woven fabrics.

2649. F. A. Theroulde, of Paris. Improvements in obtaining salts and products from the ashes of marine plants.

2651. A. V. Newton, of Chancery-lane. Improved apparatus for propelling and steering vessels. A communication.

2653. T. Spencer, of Newcastle-upon-Tyne, steel and spring maker. Improvements in the manufacture or construction of springs.

PATENT APPLIED FOR WITH COMPLETE SPECIFICATION.

2675. J. Luis, of Welbeck-st. A safe guard against burglars. A communication from S. Krotkoff. Dated Nov. 25, 1858.

NOTICES OF INTENTION TO PROCEED.

(From the "London Gazette," December 7th, 1858.)

1662. H. Barber. Knitted fabrics.
1678. J. Hardie. Regulating fluids.
1683. E. Jones. Drainage.
1684. H. Jackson. Lubricating matters.
1691. J. Emes. Folding bedstead.
1694. C. N. Kottula. Soap.
1696. G. Hurn. Fibrous materials.
1710. G. Cavaggia & A. Spinelli. Motive power.
1715. J. L. Hinks. Cleaning knives, &c.
1716. J. F. W. Featherstonhaugh and F. Wise. Steam boilers.
1722. J. Watkins. Candles.
1725. T. Webb and J. Craig. Spinning, &c.
1733. G. Ashcroft and H. W. Wood. Hydraulic machinery.
1734. G. Davies. Electrotype plates. A communication.
1740. C. de Bergue. Telegraph cables.
1744. J. W. Schlesinger. Machine for roasting. A communication.
1749. W. B. B. Harvey. Fly presses.
1750. J. L. Norton. Drying wool.
1762. J. H. Johnson. Inkstands. A communication.
1767. J. Spence. Rolling iron.
1775. L. Hall. Looms.
1792. F. H. Stubbs. Railway signalling.
1805. J. H. Johnson. Railway breaks. A communication.
1814. W. E. Newton. Mariner's compass. A communication.
1835. J. H. M. Maissiat. Wheels.
1869. A. V. Newton. Forging horse-shoes. A communication.
1907. R. Laming. Purifying gases and liquids.
1924. J. Macintosh. Insulating wires.
1950. J. Ireland. Cupola furnaces.
2186. J. T. P. Newbon, T. Smith, and J. Brown. Lifting and lowering anchors.
2285. J. C. Ollerenshaw. Cotton gins. A communication.
2320. W. A. F. Powell. Stopping jars.
2378. J. Robb. Propellers.
2399. J. W. Mott. Pouches.
2415. P. Wright. Anvils.
2441. N. Brough. Buttons.
2486. B. D. Webster and J. Horsfall. Steel wire.
2521. G. Schmidt. Core bars.
2523. G. Schmidt. Cast-iron pipes.
2524. A. J. Brooks. Screw propellers.
2525. G. Schmidt. Ladles for casting metals.
2534. T. Gray. Mixed fabrics.
2545. J. Wadsworth. Boots and shoes.
2546. W. Ashton and T. Cartmell. Pumps.
2554. C. J., T., H., and C. Thomas. Caustic alkaline lees.
2580. S. Hogg, W. P. Piggott, and S. Beardmore. Electric telegraphs.
2590. M. Caton. Looms.
2605. J. Oakes. Spurs.
2606. J. M. Miller and J. Fear. Winding yarn.
2651. A. V. Newton. Propelling and steering. A communication.
2653. T. Spencer. Springs.
2675. J. Luis. Safeguard against burglars. A communication.

The full Titles of the Patents in the above List can be ascertained by referring back to their numbers in the Lists of Provisional Protections previously published.

Opposition can be entered to the granting of a Patent to any of the parties in the above List who have given notice of their intention to proceed, within twenty-one days from the date of the Gazette in which the notice appears, by leaving at the Commissioners' office particulars in writing of the objection to the application.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

2706. S. C. Lister.
2708. W. Ward.
2719. W. Rowan.
2727. J. Barling.
2732. J. Moffat.
2735. T. M. Fell.
2751. T. Chaffer and J. Ellis.
2753. R. Bodmer.
2756. F. S. Thomas and W. E. Tilley.
2894. J. Murdoch.

LIST OF SEALED PATENTS.

Sealed December 3rd, 1858.

1248. T. Scholefield.
1254. T. Wilson.
1263. C. Hancock.
1277. J. Ferrabee.
1282. E. Vigers.
1284. R. Hicks.
1307. H. Rollinson.
1336. W. Clark.
1338. W. Clark.
1422. W. E. Newton.
1450. C. Erhard.
2076. R. Frost and A. Rigg.
2141. E. T. Wright.
2182. G. Uhlhorn.
2196. B. Samuelson.
2200. S. Stimpson.

Sealed December 7th, 1858.

1278. J. J. Rowley.
1280. J. M. Dunlop.
1281. H. Wimball.
1285. J. M. Dunlop.
1288. J. O. Quince.
1301. E. C. Grimshaw.
1304. J. Easterbrook.
1305. P. Dumont.
1308. T. Robinson and H. Ogden.
1319. J. S. Crosland.
1321. G. Hall.
1322. H. Reynolds.
1330. S. Cheavin.
1335. J. Hall.
1350. B. Pitt.
1368. T. Steven.
1407. W. and J. Galloway.
1489. W. Sellers.
1511. M. Nelson.
1514. J. Dodd and T. Phillips.
1665. H. J. Giffard.
1743. G. S. Hill.
1772. W. Clay.
1853. J. H. Johnson.
1883. R. Anderson.
2134. J. Spence.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions.

NOTICES TO CORRESPONDENTS.

Several Communications have been received which must stand over till next week.

Articles and Correspondence designed for insertion in the ensuing Numbers of the *Mechanics' Magazine* must reach the Office by the Tuesday of each week, at the latest. It is highly desirable that they should be forwarded earlier if possible.

Errata in last Number.—Page 541, second column, line 30, *for* "pump" *read* "jump;" line 37, *for* "convas" *read* "canvas;" page 543, 11th line from the bottom, *for* "tanks" *read* "trials."

CONTENTS OF THIS NUMBER.

LONDON: Printed and Published by Richard Archibald Brooman, of 166, Fleet-street, in the City of London. Sold by A. and W. Galignani, Rue Vivienne, Paris; Hodges and Smith, Dublin; W. C. Campbell and Co., Hamburgh.

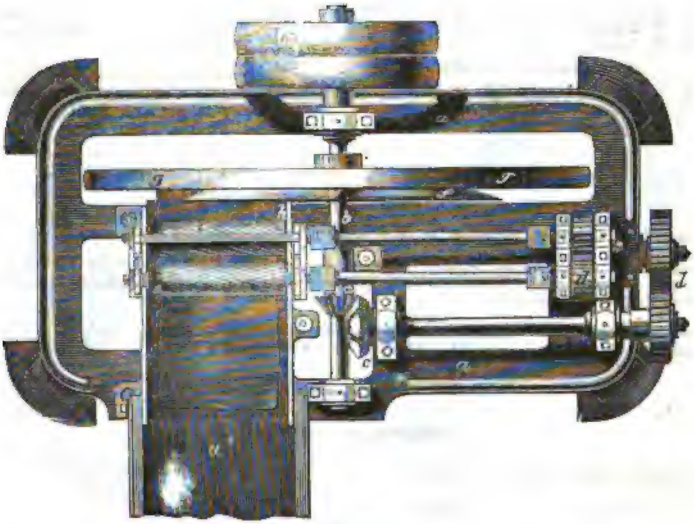
Mechanics' Magazine.

No. 1845.] SATURDAY, DECEMBER 18, 1858. [PRICE 3D.

Edited by R. A. Brooman and E. J. Reed, 166, Fleet-street, London, E.C.

ASHWORTH'S MACHINERY FOR CUTTING HIDES OR SKINS.

Fig. 1.



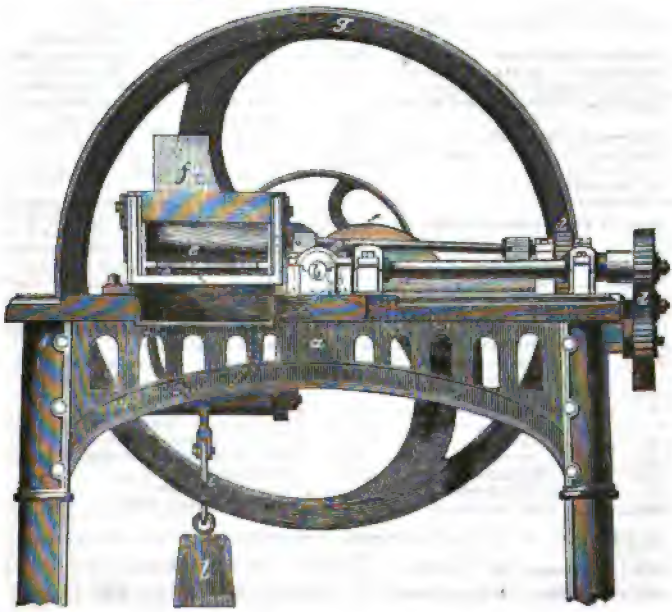


Fig. 2.

ASHWORTH'S MACHINERY FOR CUTTING HIDES OR SKINS.

Mr. Hall Ashworth, hide and size dealer, of Prestwich, has patented an apparatus for the above purpose, consisting of a driving or fly wheel, having any required number of arms, each being furnished with suitable knives or cutters to act upon or cut the hide as it is advanced thereto. The hide is fed to the knives from a supply trough or guide by two or more pairs of fluted rollers, which are adjustable in bearings and receive an intermittent rotatory motion through a train of gearing (composed of spur and change wheels) from the driving or cutting wheel. The action of cutting the hide into strips or shreds is performed by the revolution of the driving wheel bringing the cutters into contact with the hide, and cutting against the edge of a metal plate forming the end of the feeding trough, the hide being advanced at certain intervals, regulated by the change wheels, according to the width of the strips or cuttings required and the number of knives employed.

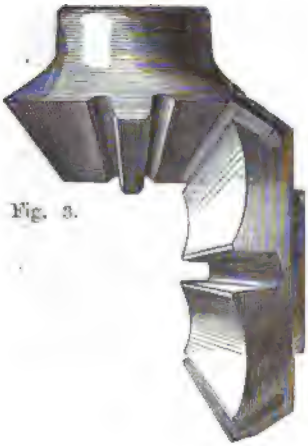


Fig. 3.

Fig. 4.

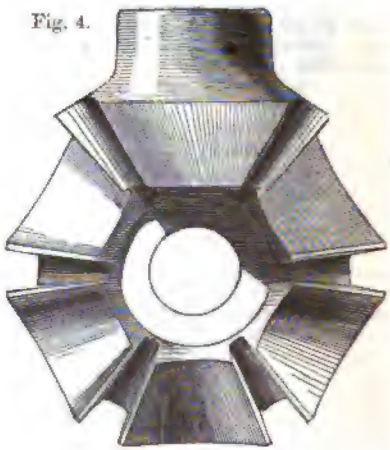


Fig. 1, of the accompanying engravings, is a plan view, showing the train of gearing for driving the fluted rollers; fig. 2 is a front elevation of the same; figs. 3 and 4 are respectively an end and front view of the pair of bevil wheels for effecting the intermittent motion by which the hide is fed to the knives. *a, a* is the framing, in which is supported the driving shaft, *b*, which imparts a rotatory motion to the bevil wheels, *c, c;* these bevil wheels effect the intermittent motion, which is transferred by means of the gearing, *d, d*, to the upper and lower sets of fluted rollers, *e, e;* between these fluted rollers, the hide is passed from the trough, *a*, and is by them propelled or fed to the knives, *f, f*, upon the driving or fly wheel, *g*, which, as it rotates, brings the knives in contact with the hide, and cuts off or severs the strip thus projected beyond the metallic ledge *h*. Any number of knives may be employed, and the strips cut may be of any width required, according to the dimensions of the change bevil wheels, *c, c;* also, any amount of pressure may be obtained and exerted upon the hide by means of the top fluted rollers in connection with the lever and weight, *i, i*.

ON THE MODIFICATIONS WHICH THE SHIPS OF THE ROYAL NAVY HAVE UNDERGONE DURING THE PRESENT CENTURY IN RESPECT TO FORM, DIMENSIONS, MEANS OF PROPULSION, AND POWERS OF ATTACK AND DEFENCE.

The following paper was read at the Society of Arts, on Wednesday evening last, by Mr. E. J. Reed, one of the Editors of the *Mechanics' Magazine*, Admiral Sir Charles Napier presiding on the occasion:

The science of naval architecture was so greatly advanced on the Continent, and so much neglected in England, during the last century, that the forms, dimensions, and speeds of the ships of the British navy were for the most part inferior, class for class, to those of the ships of every other nation with which we had to cope. The only mode of improvement which the naval authorities of that period countenanced, was that of imitating the forms of such captured vessels as were deemed superior to our own; and, therefore, as "imitation cannot go above its model," the attainment of excellence was not possible. But full advantage was not taken even of this imperfect system, for whenever the form of a foreign model of any given class was imitated, the dimensions, and therefore the power of

carrying weight and sail, were invariably reduced, and many of the best qualities of he vessel thus sacrificed. Throughout the numerous wars waged by England during the eighteenth century—with France, Spain, Holland, and America—the genius of our admirals had continually to struggle with the great evil of overburdened ships. When a British man-of-war fell into the hands of the enemy, her armament was forthwith diminished, and her efficiency thus improved, as was frequently discovered on the recapture of our own ships. The evil, however, was but little regarded by successive naval administrations, and prevailed even to the end of Lord Nelson's career, diminishing the extent, though not the splendour, of those victories with which he glorified the dawn of the present century. Happily for us, and for those colonies and states whose liberties depend upon our naval supremacy, the tactics of our admirals, and the bravery of our men, won for us much more than we lost by the inferiority of our vessels. Happily, also, that inferiority no longer exists. The ships of our navy have not only ceased to be imitations, but have become the models for the navies of the world; and I have now to trace the progress of the great changes which they have undergone—changes which embrace not minor variations merely, but entire and unprecedented transformations, consequent mainly upon the introduction of steam. In doing this I shall not enter into those details of practical construction which concern the ship-builder only, and not the commander; my object being to record those modifications of dimensions, form, means of propulsion, and powers of attack and defence, upon which the value of our ships, as engines of war, more immediately depends.

It has already been stated that our vessels of war were much inferior in size fifty years ago to the vessels of foreign navies carrying like armaments. In the war which the United States declared against us in 1812 our inferiority was disastrously demonstrated. The large frigates with which the Americans assailed our fleets stationed on their coast were too powerful to be successfully resisted. For their superiority was not confined to size alone; their armaments, likewise, greatly exceeded ours in vessels nominally of the same class; the English ships carrying many light carronades that counted as cannon, and the American being sometimes armed with guns 50 per cent. greater in number than they were supposed to bear. The result was, many a British flag was struck after hard-fought battles, and the star of our supremacy, which had burned so brilliantly since the days of Blake and the Admirals of the Commonwealth, seemed to sink in the western waters. This fact so far stirred our naval authorities as to induce them to build new vessels of uncommon size, and to razée, or cut down, several two-decked ships, and arm them as large-class frigates. Even then, however, the vicious practice of keeping the dimensions of our vessels below those of their antagonists was by no means rooted out. On the contrary, the American cruisers were permitted to retain an unquestionable superiority in their sailing powers, their armaments, and the numbers of their crews. Then, however, as before—and may I not say since?—the mistakes of our administrations were atoned for by the courage of our men; and Captain Broke and his gallant companions in the *Shannon* captured the formidable *Chesapeake*, and restored our national prestige.

When the conclusion of the wars with America and France, and the successful expedition to Algiers had left us without notable enemies, leisure was afforded for the consideration of such improvements as experience had shown to be desirable. Sir Robert Seppings, the surveyor of the navy, and the introducer of several important improvements in the frames and other portions of the fabrics of ships of war, effected great changes in their bows and sterns. After the battle of Trafalgar, the *Victory* was repaired at Chatham dockyard, of which Sir Robert was then master shipwright, and in surveying her he observed that she had suffered much on the upper or main deck when bearing down on the enemy at the commencement of the action, in consequence of the grapeshot penetrating the thin transverse beak-head partition then in fashion, which was without the ordinary timbering. It was perfectly evident, he said, that had the ship been formed with a regularly and solidly built bow many a life would have been saved. This was fully acknowledged by Captain Hardy, and after a short period the strong circular or curved bow now in use, which is framed and planked like the rest of the ship, was introduced. This bow is attended by additional advantages, including the use of bow guns, an increase in strength, and others which I cannot stay to mention. Sir Robert contended, I believe, that he was the first inventor of round bows. But that famous old ship, the *Royal Sovereign*—which Charles I. built with his fatal ship-money, and which Cromwell so vigorously availed himself of, notwithstanding her origin—undoubtedly had a round bow, as an ancient drawing, now in the model room of Somerset House, plainly evidences. This fact, however, in no way detracts from the great merit of Sir Robert's improvements.

Sir Robert next turned his attention to the sterns of vessels, and here he considered a similar change necessary to improve the defence of the vessel, to increase her strength, and to enable her to fight her stern guns with greater advantage. It was objected by some opponents of Sir Robert that the evils he believed to exist were not real—that sterns were not weak, that their fighting capabilities did not need improvement, that we had no need for stern guns in our navy at all, as we always fought and never ran, and that by improving our sterns we should only be teaching our enemies, who did run, how to arm theirs. All these objections were repeated in 1828 by the gallant admiral Sir Charles Napier, in a letter addressed by him to the *Naval and Military Gazette*, and signed "A Post Captain." It is difficult, however, to admit the validity of such statements. I consider the whole of them more than answered in an able letter addressed by Sir Robert Seppings, in 1822, to Viscount Melville, the First Lord of the Admiralty. Sir Robert there states facts which the most dashing Napierian sentences cannot destroy. The circular sterns introduced by Sir Robert were, however, undoubtedly attended by one great fault, which Sir Charles Napier pointed out in the following paragraph of the letter before referred to:—"In the first place," he says, "the rudder is too much exposed; in the second place, the ship is deprived of her counter, which I have always considered a very necessary part of her, and which one would suppose the very derivation of the word, from the French word *contre*, sufficiently proves the utility of. I apprehend without that projection the sea would come in at the cabin windows. And, lastly, the whole of the gingerbread outside of the ship would be blown away when the guns were much used." The first of these objections is, doubtless, perfectly valid, and the last is not without reason. The second, however, is not well founded. It is not possible that the use of a certain word by the French can "prove" the utility of a ship's counter. It may indicate the opinion of the French upon the point, but it can do no more. Further, it is evident that the low projecting counter of a ship may receive shocks from waves which would never climb to the cabin windows. The round stern was, however, attended by another defect, which, with the exposure of the rudder, led to its abandonment, and the adoption of its main features in a modified form. This defect was the heavy and ungraceful appearance which all agree in attributing to it. The attainment of beauty is not certainly the primary object in the construction of vessels of war; nor can the aim of their designers be that of gratifying the exquisite taste of the Poet Laureate, as, from his Isle of Wight residence, he sees

> "Below the milky steep,
> Some ship of battle slowly creep,
> And on thro' zones of light and shadow
> Glimmer away to the lonely deep."

On the contrary, if there were on earth any object in which an utter want of beauty might be deemed tolerable, it would be, I presume, a ship of war—a ship conceived and built for battle, filled with compact fires, and commissioned to thunder forth deadly destinies. But beauty is never unbecoming; we look for it even in a war-ship; and the elliptical stern, which has succeeded the circular stern, eminently possesses it. The design of this stern, which permitted the builder to afford increased protection to the stern-post, and which is now adopted in all new ships of war, was claimed by each of three late master shipwrights—Mr. Lang, Mr. Blake, and Mr. Roberts. It was introduced under the auspices of Sir W. Symonds, and in the form which is now given to it by Sir Baldwin Walker, the present Surveyor of the Navy, is a truly admirable combination of beauty and utility. The principal curves visible in it harmonize so well with the sheer lines of the ship, that she appears to float lightly and easily upon the water, whereas the circular Seppings stern, with its obstrusive stern-post, made the spectator feel not only that much of the ship was submerged, as it in fact was, but also that the submersion of the whole of her was imminent. There is, of course, no power in the ugliest vessel to sink deeper than the laws of hydrostatics will allow her; but it is not pleasant to have to correct an impression of art by reference to a fact of science. It was intended that, with the improved bows and sterns, the forward and the right aft guns might be fired in the direction of the keel, —that is, be brought to bear upon an enemy immediately in front or rear of the ship; and that the fires of every two adjacent guns, from bow to stern, might cross each other within easy range, so that the ship should have the power of defending herself, and of attacking an enemy in every direction, with two guns at least. Great difficulty was, however, often experienced in getting the bow chase guns to run out far enough to prevent injury to the ship on the discharge of the guns, for it is by no means an easy matter to make a vessel sufficiently bluff for that purpose, on the deck-line, and at the same time to keep her fine at the load water line. This difficulty has recently been evaded by the adoption of a pivot gun, raised above the fixed bow of the vessel, and capable of being turned about shifting centres at one end, and of

running on circular or segmental plates at the other. This gun commands the entire sweep of the bow, and, being usually of large calibre and long range, is admirably adapted for chasing. Its introduction into the service was a very notable improvement. The pivot gun is usually a 68-pounder—sometimes a 10-ins. shell gun—and it is fitted in all our first-rate steam line-of-battle ships, and most other steam-ships of war, including second and third rates, frigates, corvettes, and many scores of our steam gunboats. In several classes of ships a second pivot gun of like size is fitted at the stern. All our steam block-ships are thus fitted, as are also the whole of our screw steam gun vessels, numbering, according to the current Number of the *Navy List*, twenty-six. It is difficult to believe, however, that we are acting wisely in accepting the bow pivot gun as a sufficient substitute for the bow chase guns on the fighting decks of our screw line-of-battle ships, as I observe we now have done in some modern examples. The pivot gun is an exposed gun, and is liable to be disabled in action; it cannot, therefore, be prudent to depend, in a large ship, upon it alone for our power in chasing, and to deprive ourselves of the means of firing a single shot directly in advance should that one gun be injured. I am fully aware that by running this risk fine lines may be given to the vessel; but this advantage is not worth the risk which we are obliged to run in securing it, as I fear we shall prove, in the event of a naval war, if we pursue the new system.

Still more interesting changes were introduced by the successor of Sir Robert Seppings, at which I have now to glance. In the year 1819, Lieutenant William Symonds, an officer of 25 years' standing in the service, was appointed Intendant of Marine Police, and captain of the Port at Malta, and, being of an inventive turn of mind, there took to yacht building. For the knowledge of this fact I am indebted to a poem of his, in which he says,—

"In Malta I first took to naval construction,
In Malta I launched forth my maiden production."

I have elsewhere sketched the progress of Lieutenant Symonds from this period of his career as briefly as I was able, and I request permission to repeat here what I there wrote. "His maiden production was the *Nancy Dawson*, and he tells us that 'when the Hon. G. Vernon and his lady came to the island for her health, in their yacht, the *Transit*, I was introduced to them by more than one person, and we soon became very well acquainted. I made my first trial of the *Nancy Dawson's* sailing against his yacht, and had so considerable advantage that I was led to believe that I had hit upon a secret in naval architecture; and, after trying my hand upon four or five others of a smaller description, which answered beyond my warmest expectations, I was confirmed in the success of my principles by these experiments. Great breadth of beam and extraordinary sharpness' (—sharpness of what?) 'are the characteristic features of my system, with a careful attention to stowage, the stand of the masts, and the cut and setting of the sails; nor had I, in any instance, occasion to alter anything materially from my first idea. The consequence was, a firm conviction that I might attempt something on a larger scale, with every hope of success.' Upon this most slender basis was the whole fabric of Sir William's subsequent career built. The yacht gained him the notice of noblemen and others; then followed a pamphlet on naval architecture (in which the defects of many existing ships were pointed out, and great breadth of beam and rise of floor were advocated); then came a promise from the First Lord of the Admiralty, Lord Melville (obtained through the influence of Lord Lauderdale), that he should build a sloop of war on his plans, which he did, the vessel being called the *Columbine* (promotion intervening); then further patronage from the Duke of Portland, and the Duke of Clarence, the latter of whom, when he became Lord High Admiral, ordered him to lay down a 40-gun frigate (promotion again intervening); then the building of the *Pantaloon*, 10-gun brig, for the Duke of Portland, from whom the Admiralty purchased her; then the patronage of that most mischievous civilian First Lord, Sir J. Graham; then the order for the *Vernon*, 50-gun frigate; and then, in 1832, the Surveyorship of the Navy."*

The characteristic features of Sir William's designs for ships were, as we have seen, great breadth of beam at and above the water line, and great sharpness of floor.

I have not space here to discuss the merits and demerits of the characteristic qualities of the ships of Sir William Symonds, or to revive the prolonged and bitter controversies to which his elevation gave rise. Sir William was essentially an amateur shipbuilder, and the Lords of the Admiralty (influenced mainly by Sir James Graham) by investing him with supreme control of the Surveyor of the Navy's department, made war not only upon professional naval architects, but upon the profession of naval architecture itself. The consequence was that shipbuilding officers, both of the old tentative school and of the new scientific school, which latter had lately been called into existence by their

* *Mechanics' Magazine*, Vol. 68, No. 1812, p. 413.

lordships, strenuously resisted Sir William's innovations; but as he was supported by powerful friends, and had a large amount of patronage in his own hands, while his opponents were almost, without exception, his subordinates, I need not say who for the time triumphed. It should be observed, however, that the principles of construction for which Messrs. Read, Chatfield, Creuze, and others trained in the school of naval architecture, contended, are to a great extent predominant at the present day in the Royal Service, while not a single feature of Sir William Symonds' system of construction is retained,* except certain practical improvements which he made in the actual building of ships, and which deserve to be mentioned with the utmost favour. Still his services as a naval constructor were not without value to the country. He was the first who proved successful in breaking down and abolishing that vicious system of restricting constructors to certain arbitrary dimensions to which I have before referred, and in which the Admiralty persisted until his time. This was no small service. He also brought into his department an energy which filled it with vigour, and prepared the way for those sound and scientific changes which his more temperate successor has promoted with equal zeal and superior judgment.

Had Sir W. Symonds lived a century earlier, his career might have closed in brightness and triumph; but, coming when he came, he had scarcely raised himself to his high office before he began to feel his schemes and crotchets baffled by a power whose marvellous progress no devices of man can withstand. The all-changing, irresistible power of steam, against the mastery of which so many have vainly mutinied, began to make itself felt in the Royal Navy even before Sir William commenced experimenting at Malta. In 1815, Lord Melville ordered an engine to be built for the sloop-of-war *Congo*, and although that vessel was not fitted with it, the design of propelling ships of war by steam was not abandoned. In 1821, the *Monkey*—a vessel which is still, I believe, doing duty at Woolwich—was purchased by the Admiralty, and her name is likely to become memorable as that of the first steamer the Royal Navy possessed. Her purchase was followed by the building of the *Comet* at Deptford dockyard, under the direction of the late Oliver Lang, Esq. Other vessels succeeded rapidly, some designed by Sir Robert Seppings, others by the master shipwrights of the dockyards, and others by private builders. All were, of course, for many years fitted with paddle-wheels. Ultimately, in the year 1832, Sir William Symonds had the designing of steam, as well as all other vessels for H. M. Service, committed to him as Surveyor of the Navy.

Nothing more unpropitious for Sir William's mode of construction than the introduction of steam can be conceived. His sharp bottoms were the very worst possible for the reception of engines; his broad beam and short length the most unfavourable qualities that could be devised for steam propulsion. As much as he could he adhered to his principles, and, although compelled by sheer necessity to adopt an increase of length and a greater fulness below water, he changed his plans as little as possible. Rather than yield to the demands of the new power, he sacrificed the armaments of his vessels, kept down the size of their engines, and recklessly exposed the machinery to shot should they go into action. To his lasting honour, Sir Charles Napier exposed and fought earnestly against these great evils; not with any immediate success, it is true, but the introduction of steamers with guns upon the main deck was mainly the result of his just, persistent, and courageous denunciations of the system under which the expense of large vessels and costly engines was incurred with no better result than that of bearing half-a-dozen guns about.

In the year 1837, Captain Ericsson made a very favourable run down the Thames in a steam vessel fitted with his patent screw propeller, having the Lords of the Admiralty and Sir W. Symonds on board. Notwithstanding the success of the experiment, and the manifest advantages of a submerged propeller for a ship of war, Sir William made no sign in favour of the new

* As an example I may refer to the forms of midship section advocated respectively by him and by them. Sir William's great principle, or rather Sir William's great crotchet, was the sharpening the floor of the ship, at the same time carrying her greatest breadth considerably above the load-water line. The latter he deemed essential to stability. The members of the School of Naval Architecture, on the contrary, pointed out that, by making her sharp of floor, and broader above the water line than at it, the ship, when inclined by the wind, by tending to immerse more of herself on one side than emerged on the other, would be moved bodily upwards, and thus subjected to vertical motions, more or less violent, which would tend to the injury of her fabric and the discomfort of her officers and men. They, therefore, recommended the midship portion of the side of the ship should be either vertical, or similarly inclined immediately above and below the water line, and considered that nothing better than a side vertical between wind and water could be chosen for a ship of war. I have only to add, on this point, that all new ships of war now have the full floors and vertical sides which they recommended. Thus, on two points of the very first importance, Sir William's ideas have been discredited, and the same may be said, with equal truth, in respect to his third doctrine—that of the necessity of giving great depth of beam in proportion to length. The proportion is less now than ever.—E. J. R.

instrument. Captain Ericsson, therefore, took it to the United States, where it was speedily introduced into the war navy of America. Three years afterwards, in 1840, the *Archimedes*, fitted with Mr. Smith's patent screw propeller, made many highly successful trial trips, which were reported to the Admiralty by officers of their own. After further opposition and a further delay of years, the *Rattler*, a ship of war, was adapted at Sheerness to receive a screw propeller, and after numerous experiments with screws of different forms, the two-bladed screw now exhibited at the Patent Museum, South Kensington, was finally adopted as the best that could be devised. In 1845, the *Rattler* was tested in comparison with the *Alecto*, a paddle-wheel vessel of similar form, size, and steam power, and the test still further established the superiority of the screw. The *Rattler* was by chance built with a particularly fine run aft; but as this was not known to be essential, other screw steamers were commenced with a greater fulness near the stern. The access of the water to the propeller would thus have been seriously interfered with, but Mr. Lloyd, now the chief engineer and inspector of machinery in the steam branch of the Surveyor of the Navy's office, very wisely foresaw the evil, and induced the Admiralty to take the necessary steps for its prevention. Since 1846, the building of screw ships has become so general, that not only has the paddle-wheel been altogether superseded in all newly-built fighting vessels, but there is not even a single ship unprovided with a screw now on the stocks. Every ship now built is fitted with that steam-driven submerged propeller the introduction of which the late Surveyor of our Navy, only eleven years since, was obstinately resisting, and had obstinately resisted for eleven years previous. Surely the policy of placing it in the power of one prejudiced man to prohibit the nation for many years from rendering its greatest scientific achievement available in its own defence, when other nations were extensively adopting it, is deserving of nothing but unmitigated reprobation.

Admiral Sir Charles Napier, to whom I have had occasion already to make frequent reference, was among the very first to apply iron as a material for constructing steam-vessels. With Sir Charles Napier was associated Mr. Charles Manby, the much-respected secretary of a contemporary professional institution. Together these gentlemen formed a society, and built the first iron steam vessel, the *Aaron Manby*, which Sir Charles took charge of, and navigated to Paris. Other vessels followed; but for their history I must refer you to Mr. Grantham's admirable volume on "Iron Shipbuilding," in which their progress is traced from the earliest example up to that magnificent vessel to which the London public are now thronging, and which, by her excellence of design and her strength of structure, even more than by her immense magnitude, excites the astonishment and admiration of all intelligent beholders.

In 1842 Mr. Belmano, of New York, addressed a letter to the Earl of Aberdeen, alleging that plates of iron ⅜ths of an inch thick had been riveted together to a thickness of six inches, and then found to be ball-proof. Sir Thomas Hastings, of H.M. gunnery ship *Excellent*, was instructed to discover if they were so. After making the experiment, he reported that such a combination of plates fixed over the planking of a ship's side would give no protection at two hundred yards against shot fired with 10lbs. charges of powder from 8-inch guns and heavy 32-pounders.

In 1843, however, the Admiralty commenced building iron ships of war, and in three years built and purchased 18 such vessels (besides several others not intended to carry armament), at a cost of £420,000, and £260,000 additional for engines—in all about £680,000. I can offer no reason for this sudden and unexpected movement, which, as I hardly need say, ended in failure. It may have been the result of a well-meant, but ill-advised, attempt to give a rapid expansion to the power of the Royal Navy, or it may have been due to secret influences brought to bear on some member or members of the Board of Admiralty by interested parties. But of that ingenious and complicated system of wheels within wheels by which our public departments are often worked, I cannot presume to speak. Like millions of others, I know but little save of that one great wheel, the outermost of all, which rolls perpetually along the land, whose revolutions never cease, and from whose path but few escape—the colossal and ponderous wheel of national taxation. Of the wheels within which move *that*, who has any just or adequate knowledge?

In the construction of mercantile vessels iron is superior to wood. Iron ships, as compared with wooden, may be built lighter and stronger, of greater capacity, of superior speed, increased durability, and at a less cost both for purchase and repairs. In Great Britain, moreover, iron is much more abundant than wood, and its manufacture is now becoming improved almost daily. On the other hand, the bottoms of iron ships get rapidly foul, and their hulls, when of moderate thickness, are shattered by the action of shot much more injuriously

than the hulls of wooden ships. The first objection is got rid of in merchant vessels, by cleaning their bottoms when they come into port, which they frequently do. The second is, of course, not directly applicable to them. But the rapid fouling of the bottom of a vessel of war, which is often engaged for years together far from all facilities for cleaning her below water, would, at all times, be a highly injurious, and often a fatal evil. The destructive action of shot upon such a vessel is a still more decided ground of inefficiency. These facts were not considered by the Admiralty in 1843, and when Sir Charles Napier mentioned in the House of Commons the folly of building five or six iron steamers without trying one, the Secretary of the Admiralty exultingly exclaimed, Sir Charles informs us, "We are building forty." They did build, not forty, but eighteen, at a cost, as I have said, of considerably more than half a million.

Experiments were made at Woolwich Arsenal to test whether, if iron were lined with kamptulican—a mixture of india rubber, cork, &c.—the holes formed in the fabric by the shot would not be stopped after the shot's passage, by the closing up of the elastic substance. Some advantage was gained in this way, but not sufficient to lead to the adoption of such a combination. In 1846, the *Ruby*, a small vessel, built of thin iron, and in a bad state of repair, was fired at from the *Excellent*, and Captain (now Admiral) Chads reported that the shot passed clean through the near side of the vessel, but that on the off side the effect was terrific, tearing off the sheets of iron to a very considerable extent. Splinters from the near side were few but severe. These conditions were reversed by subsequent experiments made by Admiral Chads, the near side being found to suffer most in stronger vessels. In July, 1850, after numerous experiments, he finally reported that iron could not be beneficially employed as a material for the construction of vessels of war. Since that time the building of iron ships of war has not been proceeded with.

I come now to the period of the late war with Russia, which, though a military rather than a naval contest, did not fail to exert important influences upon the constitution of the Royal Navy. That war opened, it will be remembered, by a Russian attack on a Turkish squadron at Sinope, November 20th, 1853, at a time when Russia had bound itself by a solemn promise to act on the defensive only. The Turkish squadron consisted of 7 frigates, 1 sloop, 2 corvettes, 2 steamers, and 2 transports, supported by five land batteries. The attacking squadron was composed of 6 line-of-battle ships and 2 frigates, supported by three or four steamers. The latter squadron was well supplied with shell guns, while the Turks had nothing more effective than 24-pounders. The action was speedily decided, by the burning of almost the whole of the Turkish vessels, produced, as the surviving officers stated, exclusively by the shells of the enemy. The only frigate that remained afloat after the action, the *Damietta*, had seventeen shots through her below water, and was therefore burnt. I mention this engagement merely as an early and notable example of the destructive effect of shell guns in naval warfare, the remarkable circumstance being, not that the Turks were beaten—for the Russian force was vastly superior to theirs—but that their whole force of fourteen ships was, to a great extent, silenced in a few minutes, and utterly crushed in little more than an hour.

It has been fashionable, in some quarters, to sneer at the operations of the combined navies of England and France in the Black and the Baltic Seas during the war; but the spectacle of one Russian fleet sunk by Russian hands at Sebastopol, and of another trembling, season after season, behind stone fortresses in the shallow waters of Cronstadt, never daring to accept the challenge of any British squadron, however small, is one the record of which we certainly may read without shame. Still, the fleets of England, though well adapted for battles by sea, and sufficient to drive the enemy from the open waters, were almost totally deficient of the class of vessels which were essential to the putting forth of our full power against his fleets and coasts. Nor was the want supplied with anything like that promptitude which the occasion demanded. It is difficult, with all the facts before us, to believe that the neglect occurred in the Naval Department. The Government, it will be recollected, was inactive; slow not only in entering upon war—which all governments should be; but slow also in conducting the war after it was entered upon—which no government should be. When they grew vigilant and active, and the Naval Department was called upon to provide light-draught steam vessels without delay, the work was entered upon with astonishing and admirable rapidity. All the capabilities of the royal dockyards were put into instant requisition; the Government steam factories were everywhere expanded, and in some places, such as Sheerness, created; and private builders were called upon to take up large contracts. The execution of these contracts, though performed with the utmost alacrity and good-will, involved the contractors in serious pecuniary losses, which the Surveyor of

the Navy exerted himself to mitigate, and did mitigate to some extent. This evil was, I grieve to say, greatly aggravated, if not altogether occasioned, by the excessive demands for wages made upon the contractors by their workmen, who knew they were needed, and straightway played the tyrant. As a correspondent of mine truly wrote some months since, "The reminiscence of the Russian war, to those who built the gun-boats, is an exceedingly painful one. Ruin befel one or two of those builders, and all sustained heavy pecuniary loss. The only relieving light it has is the indelible impression which the urbanity and sympathy of Sir Baldwin Walker evinced, and the appropriateness and beauty of form of the vessels which his immediate assistants designed." The last sentence implies a fact which some have doubted. The "appropriateness and beauty of form" of the new gun-boats, gun-vessels, and despatch vessels have been questioned. No one, however, who has seen the corresponding vessels built by the French, and who understands *all* the difficulties of combining speed, lightness, sea-worthiness, and a powerful armament in one vessel, will question them. Mr. Scott Russell's paddle-wheel gun vessels, the *Recruit* and *Weser* (formerly the *Nix* and *Salamander*), are in many respects most excellent vessels, and the former proved very valuable in the Sea of Azof. Captain Dahlgren, of the American navy, mentions her as "highly spoken of, being a fast and an excellent sea-boat;" but the same experienced officer says also of the Admiralty's vessels, "For the service contemplated, this fleet of small screw-vessels was well adapted—far better than any other." Further, Sir Howard Douglas, Bart., the distinguished author of "Naval Gunnery"—to whom the naval service is more indebted than to any other man living or dead for the efficient use of its armaments—published only a fortnight since a treatise on "Naval Warfare," in which, while he complains of the great length of the despatch vessels as a cause of weakness, he adds, "A smaller class of steam-vessels has since been constructed as gun-boats, and these come fully up to the author's idea of what a good gun-boat should be." They possess, however, one great defect in the rapidity with which the tube-plates of their boilers burn out. So great is this evil in the gun-boats, that in the mere trials of the engines the boilers often become so bad as to require extensive repairs.*

The Admiralty have frequently been accused of building line-of-battle ships in profusion, to the neglect of frigates and lighter vessels. If there was some show of reason in this charge at the commencement of the Russian war, since that period there has existed no ground for its repetition. Our navy is now composed of the following fighting vessels:—First, 201 sailing vessels of all classes—but few of which, probably, will ever again be commissioned. (Might not some of these be sold with advantage? Scores of them, which will not be used again as ships of war, would be valuable for many mercantile purposes, and should not, therefore, be permitted to rot in our harbours.) Next, we have 75 paddle-wheel steamers, most of which, though not very effective for fighting purposes, will, while they last, be of considerable value in times of peace, and of some service even in war. Finally, we have a fleet of screw steam-ships and vessels, to the constitution of which I desire to draw particular attention. It consists of 51 line-of-battle ships, each armed with 8-inch shell-guns and 32-pounder solid shot guns, in various proportions, together with one, and in some cases two, pivot 68-pounders; 9 block-ships, also armed with 8-inch shell-guns, and 32-pounders in various proportions, together with two 68-pounders and four 10-inch shell-guns to each ship; 28 frigates, most of them powerfully and some of them very formidably armed—the engines of 16 of the 28 being at least of 600 nominal horse-power; 13 corvettes, each carrying twenty 8-inch shell-guns, and at least one 68-pounder, or one 10-inch shell-gun; 8 other corvettes, armed with 32-pounders, and at least one pivot gun each; 4 mortar

* I have great pleasure in being able to state that Rear-Admiral J. Jervis Tucker and Mr. Blaxland, Superintendent Engineer of the factory at Sheerness Dockyard, have energetically endeavoured to remedy this evil, and have succeeded in getting rid of the troublesome and expensive tubular system altogether. They simply employ a series of several fireclay bridges within the furnace, in conjunction with means for admitting air, at the same time diminishing the size and increasing the number of the fire places. The system answers perfectly, and not only does away with the derangements and expenses attendant upon the tubular system, but also increases the evaporation, prevents the formation of smoke, greatly economises the fuel (a very important point in marine boilers), and renders the supply of steam to the engine surprisingly uniform. Some delay has occurred in the adoption of these improvements by the Steam Department of the Admiralty, mainly, I believe, in consequence of Captain Halsted and the engineers of the steam reserve at Sheerness having instituted experiments with a modified form of tubular boiler, which appears to me to be either the same as, or a very slight variation of, the boiler patented by Mr. Bartholomew in 1856. It is difficult to believe that there can be any partiality on the part of the Steam Department of the Admiralty to tubular boilers, the defects of which have been so fully explained by this Society's distinguished prizeman, Mr. Charles Wye Williams, and I am happy to hear that the Admiralty contemplate having a gun-boat or two fitted for trial with the improvements of Admiral Tucker and Mr. Blaxland.—E. J. R.

frigates, with 13-inch mortars, 68-pounders, and 32-pounders; 8 floating batteries, entirely with 68-pounders; 27 sloops, mainly with 32-pounders; 26 gun-vessels, with 68-pounders and 32-pounders; and 163 gun-boats, each with one 68-pounder and one 32-pounder—in all 331, inclusive of a few now building and undergoing alterations. It is impossible to examine these figures without observing that the number of our frigates, corvettes, sloops, and still smaller vessels, is very large as compared with our ships of the line; and it is, in my judgment, equally impossible to point out any very glaring defects in the principle upon which they are armed. This latter statement cannot well be tested otherwise than by a comparative reference to foreign navies. The only two of these to which I need refer are those of France and America. As to the former, I have carefully examined the official records (which are published by Sir Howard Douglas in his "Naval Gunnery"), and I find no ground whatever for considering that the armaments of French ships of war are in any way superior to our own. With regard to the American navy, we have, indeed, heard much that sounds formidable, recently, especially of the *Niagara* and the *Merrimac*. Of the former of those vessels I need say but little, as the American Government itself places small confidence in her. She is, it is true, a gigantic vessel, but she carries only a dozen shell-guns; and our own frigate, *Diadem*, of about two-thirds her size, would, as I have elsewhere shown, speedily overpower her, either at short or at long range. The *Merrimac* is certainly a very formidable vessel. Captain Dahlgren, in a recently published work on "Shells and Shell Guns," draws a careful comparison between her and our own *Shannon*, the name of which will be fresh in every mind, as the last command of the chivalrous and much-lamented Sir William Peel. Captain Dahlgren very fairly decides that the *Merrimac* is the more powerful ship of the two; but seeing that, as he admits, her tonnage is one-fifth greater than the *Shannon's*, we might well be astonished if she were not of superior power. We have, however, other vessels similar in size to the *Merrimac*, one class of which is armed entirely with heavy 68-pounders, from which, of course, 8-inch shells can be most effectively fired; and another class armed with a combination of 10-inch shell-guns and 68-pounders of 95 cwt. The vessels of both these classes are fitted with engines of no less than 1,000 horse-power, by virtue of which they will probably attain a speed of twelve or fourteen knots per hour, while the *Merrimac* makes eight knots only. The advantages of this superiority of speed I need not dwell upon. Captain Dahlgren has himself since said, in reference to these vessels, "There can be little doubt that with any reasonable success in applying their capabilities they must become the most formidable of ships of war."

Although I have thus pointed out the efficiency of our ships as compared with those of France and America, I by no means wish to imply that the armaments of our steam fleets are not susceptible of improvement with the means already at our disposal. The very variety observable in the armaments of ships of similar dimensions indicates imperfection, and even evinces a sense of imperfection in the minds of the authorities who arrange them. Moreover, Sir Howard Douglas and Captain Dahlgren have particularised one class of gun which is much used by us, but which is too light for its duty, namely, the 10-inch shell-gun of 86 cwt. This gun has been superseded in the American navy by one of 107 cwt., and should certainly occupy a less prominent position in ours. Other desirable modifications might, doubtless, be made, and the whole subject requires still deeper study than appears to have been bestowed upon it. It is, however, far too broad for any complete discussion of it to be here attempted.

Before passing to topics of a novel character it should be stated, however summarily, that in respect of those great features to which I have this evening to refer—viz., dimensions, forms, means of propulsion, and powers of attack and defence—the ships of our navy have become, during the Surveyorship of Sir Baldwin Walker, the embodiments of all such sound and well-tested improvements as have hitherto been found compatible with the purposes for which ships of war are designed. This is a very broad statement, and one which I should not venture to make on my own responsibility only, lest it should seem to offer a compliment which, coming from a private individual, would at least be valueless. But as the present Surveyor of the Navy is so often commended in Parliament, by officers of the greatest judgment and experience, I do not hesitate to speak of the facts as I find them. I may state then, first, that the dimensions of our ships are increased as necessity seems to require, without any kind of prejudice. We have 50-gun frigates now of nearly one-fourth greater tonnage than the largest line-of-battle ships of fifty years ago. Then the tonnage averaged in large ships about twenty-five tons per gun; now it averages in our frigates fifty tons per gun. It is true that this difference partly arises from the introduction of the engines and

fuel; but it is also greatly due to a wise increase in the carrying power of the ship independent of her steaming requisites. Again, the form of our present ships has been adapted, by the introduction of fine water lines, to the circumstances attendant on screw propulsion, so as to ensure those high speeds for which our navy has lately become remarkable. Sir Howard Douglas, in his new treatise (on "Naval Warfare") refers this quality partially "to the adoption of the *wave principle* in forming the bows." This, however, is a mistaken, though a very pardonable supposition. Mr. Scott Russell's wave-line theory—which, whether right in all or in some only of its features, has been the occasion of vast improvements in ship construction—is not, I believe, adopted by the Admiralty. Many of their ships have, it is true, some water lines which are hollow, but this has arisen, not from a preference for hollow water lines as such, but from the necessity of combining a convex bow above the load water line with fineness and straightness of form at that line, which cannot well be done without giving a slight degree of concavity to the bow below. The extent to which the present Surveyor has adopted the screw propeller has already been mentioned, and it may be here added that most of the engines fitted to the steam ships of our navy are among the finest specimens of marine engineering. The remarks I have already made on the armaments, and those I have presently to make on the armour defences of our modern war ships, will be seen, on the whole, to give completeness to that favourable opinion which I am here expressing. All this does not of course imply the absence of minor defects; but it does indicate that the present Surveyor of the Navy, with his able and well-trained scientific assistants, has not been slow to adopt changes, when change was associated with improvement.

I have now to consider the exceptional vessels, denomimated floating batteries. The first I shall mention is the *Spanker*, which was designed about the year 1800 by Mr. Richard White, and of which Mr. Fincham, in his "History of Naval Architecture," gives the following account:— "This vessel was intended to be a formidable floating battery, to carry guns of large calibre and mortars, so as to be suited for offensive operations in bombardment as well as for the defence of harbours. She was on the deck, 114 feet 6 inches; 42 feet 4 inches in breadth. The main deck was of an oblong shape, and square across at the bow and stern, so that four guns might be fired in lines parallel to the keel. This deck was made to project beyond the bottom, and was intended to be sufficiently high above the water that when boats should go alongside to board, they might be drawn under the projection, in which scuttles were formed to fire through into them; but the ship had not enough displacement, and the projection was therefore brought too near the water for the boats to go beneath it. Under sail this vessel was unmanageable: hence she was soon kept for harbour service alone, at Sheerness."

No floating battery was again undertaken in England until the late war with Russia, when the Emperor Napoleon commenced the building of several of these vessels, propelled by steam, and protected over their whole assailable surface with thick armour plates of iron. The original conception of iron-plated vessels has been generally attributed to the Emperor; but he was by no means the first proposer of them. In the second volume of the *Mechanics' Magazine*, published in 1824, was an article in which notice was taken of a memoir written by a M. de Montgery, a captain in the French navy, in the following terms:—"M. de Montgery contends, that while we have vessels of war constructed of wood, they should at least be plated with iron. Long before any one had thought of substituting metal for wood in the construction of large vessels, plates of iron or brass had been used for covering ships of war and battering rams. The celebrated galley built by Archytus and Archimedes, for Hiero, tyrant of Syracuse, was cased in this way. Philo of Byzantium afterwards proposed using battering machines made entirely of metal; but Father Mersenne appears to have been the first who thought of adopting them for ships. M. Montgery says, that to render the sides of a vessel shot and shell proof, they should have a plating of iron about six inches thick; that is, a series of sheets of iron with blocks of cast iron between." The proposal to use plates of iron on the sides of ships was likewise made many years ago by General Paixhans, in his "Nouvelle Force Maritime."

The Emperor Napoleon having undertaken the construction of such vessels, and the English press having become apprised of the fact, a similar undertaking was, to a certain extent, forced upon the Admiralty, and the eight remarkable structures which now exist in our harbours are the result. It cannot be denied that these vessels were prematurely built, or that they are in many respects inefficient as ships of war. In the 4th edition of his "Naval Gunnery," published in 1855, Sir Howard Douglas stated several very cogent facts bearing upon the construction of these craft. To one passage in particular I would refer: "Nor will iron slabs, 4½ inches thick," he said,

"be proof against 68-pounder or 84-pounder solid shot, with which it appears the Russians are plentifully provided; and, unless the timbers of these vessels are enormously thick, such heavy shots will not only punch holes in the iron, but may also make great breaches in their sides by their prodigious power." In confirmation of these observations I may state, that some of the worst effects stated to have been produced by the late gun-practice at Portsmouth upon the *Meteor* and *Erebus*, floating batteries, were consequent upon the yielding of the timbers, or of the ribs, rather than upon the penetrability of the plates. I cannot speak with absolute certainty upon this point, because, as the experiments were of great public interest, the Lords of the Admiralty were most careful to have the shot-holes covered over with canvas as soon as they were made! I have since applied to their lordships for copies of the reports made upon the trials, but their lordships were unable to comply with my request.

And here I may be permitted to mention a remarkable idiosyncracy of Lords of the Admiralty, viz., that they seem to consider it a special function of theirs to deny to the British press and the British public, and to the natives of minor states from which we have nothing to apprehend, information, and facilities for gaining information, which they cheerfully accord to officers of the French, Russian, Austrian, American, and all other Governments which can by any chance prove inimical to us. I have known Russian officers, in particular, have authority to pass freely over our dockyards, while Brazilian officers are refused permission to enter the gates even to see a ship launched, and while Englishmen have to go about under the *surveillance* of a policeman. While no manifest good results from this system of being needlessly communicative to dangerous foreigners, and needlessly secretive to innocent Englishmen, it has the effect of occasioning much unnecessary and injurious babbling in newspapers and elsewhere. When all that the Admiralty do is done secretly, so far as we are concerned, men the most insignificant, whom a plain fact or two would appal, consider themselves quite safe in penning grandiloquent essays upon Admiralty shortcomings; and even just and able men are often betrayed into false criticism. And a greater evil is still to be found in the trouble occasioned by incompetent persons undertaking to do the work which the Government appears to neglect so grossly. Scores of well-meaning men, at this moment, believe that the offices of the Admiralty and the Surveyor of the Navy stand in the midst of all the bustle of modern progress, like a kind of sleeping palace, to the inmates of which—

> "Faint murmurs of improvement come,
> Like hints and echoes of the world,
> To spirits folded in the womb;"

—such men never thinking for a moment that most of the propositions which they are content to put forward in the crudest possible form, have long since been thoroughly examined, down to their minutest detail, in the offices at Whitehall.

And while I am speaking, parenthetically, I would remark that there are some facts now kept scrupulously secret by the Admiralty, to which publicity should undoubtedly be given, viz., the results obtained on the trial trips of the steam-ships of the navy. These are of the utmost importance to men of science, who are anxiously waiting to apply them to the elucidations of difficult questions of fluid resistance—questions of fundamental importance in naval architecture; and as the ships were built, the engines provided, the fuel furnished, the facts observed, and the results recorded, all at the public expense, it is difficult to see by what right any paid servant of the Crown or country prints these documents—still at the public expense—and then turns the key of his desk upon them. This subject must be pursued hereafter, if the ground of complaint be not removed.

But, to return: the floating batteries built by the Admiralty are undeserving of that utter condemnation which some have pronounced against them. Sir Charles Napier, for instance, committed a great error when, in a letter to the *Times*, he mentioned "iron floating batteries which could hardly swim, and if they could would have been useless, for had they been placed within 400 yards of Sveaborg they would have been annihilated, and at 800 yards they would have done no harm." Those batteries are armed, as before stated, with 68-pounders, and Sir Thomas Hastings's experiments on the *Prince George* hulk twenty years ago proved that at 1,200 yards 68-pounders are highly destructive, and we all know that they are so at even much greater ranges. The true defects of the batteries lie, not in any weakness of armament, but in their slowness of speed, their unmanageableness at sea, and, as the late experiments appear to show, the weakness of their frames.

But scant justice would be done to the designers of H. M. ships if I were to omit to state that the difficulty which besets this question of the construction of iron-plated war ships—of which we have lately heard so much—is far greater than amateur designers appear to understand. Of the many

scores of propositions which have been made of late years but extremely few will bear the test of a practical embodiment. The first, and, indeed, the only very serious difficulty experienced in designing ships to be plated with iron four inches thick and upwards, is that of supplying sufficient displacement to sustain the imposed weight without resorting to great draught of water or immoderate dimensions. Various devices have been proposed for evading this difficulty, the most notable of which is that of covering a portion only of the vessel with armour plates—the bow, according to some; one side of the ship, according to others. These plans are for the most part attended by too many and too great disadvantages for them to be adopted. Propositions have likewise been made for covering ships with strips of iron, filled in between with hard wood; for reducing the thickness of the iron plates and backing them with india rubber; and for many other modified arrangements. But hitherto experiments have proved adverse to these plans. It has been further suggested that the submerged portion of the ship might be made much longer than the portion above water. This plan has been adopted to a limited extent (for a different purpose) in the French gun-boats; and, although experienced naval architects will discern several objections to this mode of construction, it appears to me likely that the displacement might in this way be increased without the entailment of any great drawbacks.

Another proposal which I have met with in several quarters is that of reducing the thickness of the iron armour and placing it at an inclination, in order to reduce the effect of shot, which are supposed to strike horizontally. The name of Mr. George Rennie is most prominently associated with this proposal, in consequence of his having read a paper in advocacy of it at the British Association in September last. Mr. Rennie prefers the use of curved plates, but as a curved surface is but a surface of varying inclination, the principle involved is of course the same in both cases. It needs, I find, no appeal to experiment to show that the proposed arrangement would not be attended by any advantage. The simplest theoretical consideration shows that, for a given height of bulwark, the same quantity of metal will be required to resist a given blow, whatever the inclination may be. If a shot moving horizontally strikes an inclined plate, the crushing force exerted upon the plate is equal to the crushing force which would have been exerted upon it if upright, multiplied by the sine of the angle between the inclined plate and the horizontal. To keep the crushing effect constant, therefore, the thickness of the metal must also vary as the sine of that angle; and since the length of the inclined section varies inversely as that sine, the sectional area of the plate, and consequently its weight, remain unchanged. Hence, the side of a ship will require the same weight of metal upon it in order to resist horizontal shot whether it be upright or inclined. The curving of the plates would render it necessary to make them of a variable thickness throughout, if the minimum amount of metal is to be used, and I need hardly say that plates could not practically be used in this manner. Another important objection to Mr. Rennie's system is, that an inclined side would be much more injuriously exposed than a vertical side to the action of shot and shell fired from long ranges, and of a plunging fire like that of the *Wasp* battery, from which several ships suffered so severely in the attack on the sea-faces of the fortresses of Sebastopol.

Sir Charles Napier's plan of cutting a three-decked ship down to a frigate, covering her with thick armour plates, fitting her with a screw, and arming her with 10-inch guns, as proposed by him in the House of Commons in April last, superficially appears a very reasonable one. At the same time it is one that Sir Charles himself would probably, on mature reflection, consider it not prudent to adopt. It would cost from £80,000 to £100,000 to alter a single ship in this way, and when altered she would be deficient of some of those excellent qualities which he has for many years justly extolled.

It is time that all those who concern themselves with this great question of how iron may best be rendered available for the defence of ships' sides, should recur to the circumstance which gave rise to it, and to the true end to be at present attained. That circumstance, undoubtedly, was the introduction of Paixhans shells into naval warfare; and the end desired is the application of means by which the entrance of those terrible missiles through the side of a ship may be avoided. The attainment of this end would leave us subject only to the entrance of solid shot, to which all our ships were exposed during the wars in which we won our supremacy, and from which no practicable system of iron plating can at present be expected to save us. The attempt to build ships which shall be proof to solid shot—at least, to wrought-iron solid shot—is an altogether illusory one; and such ships are not urgently required. It is as a defence against shells, and hollow charged projectiles generally, and against these only, that iron plating can yet be made available. By applying iron of very great thickness between wind and water, we may reduce the liability to injury by

shot at that important part, and it may be well to do this; but if the upper works are made shell-proof we can expect no more. These considerations reduce the question to a form in which it may be practically dealt with, and I doubt not the solution of it is not very distant.

The only suggestion I have personally to offer upon the point is one in which I find I have, like many others, been altogether anticipated by the gentlemen at Whitehall, but which I may nevertheless mention. It will be evident that fifty feet in length of iron plating on the bow or stern of a vessel, while they would weigh the same as fifty feet of similar plating near midships, would cover and protect a much smaller volume of the ship. I would propose, therefore, that the midship portion of the ship only be protected, and that it be separated from the forward and aft portions by strong iron water-tight compartments, so that, however much the extremities might suffer, the ship would still be safe, and the men protected. Means would, of course, have to be provided for extinguishing any fires which might be occasioned by shells in the undefended portions of the ship. This plan has been considered, I believe, but whether it is judged favourably or not I am unable to say—probably not, as it does not appear to afford any defence against raking shot.

I have yet to notice a correspondence which has lately appeared, chiefly in the *Times*, on the construction of what are called "steam rams," in mentioning which reference need only be made to the designs of Mr. J. Nasmyth and Vice-Admiral Sartorius. I have not taken the trouble to inquire who first invented them, because I consider little invention was necessary in the matter, when the mind was once permitted to contemplate the use of such agents of destruction. Any merit that may exist in relation to them must arise either from the development of special adaptations, contrived so as to render the embodiment of the general principle practicable, or from the setting forth of arguments tending to show the possibility of employing such agents with undoubted advantage. Neither Mr. Nasmyth nor Admiral Sartorius has hitherto done either of these things publicly. Mr. Nasmyth informed us, in the *Times*, that he sent detailed plans of his proposed vessels to the Admiralty several years since; and, were his time less occupied than it is just now by those scientific studies and labours for which he is so justly and eminently distinguished, we should have had the satisfaction of examining similar plans here this evening. In the absence of these, however, it is impossible to say whether he has fully grappled with the practical difficulties which have to be overcome, and fully arranged those details in which the whole question of practicability or impracticability is really, in such cases, involved. I have some reason, however, for thinking that Mr. Nasmyth has done much in this respect; for, on requesting him to inform me if he had made provision for enabling the engines of the ram to sustain the shock of a collision, I found that, although he did not apprehend derangement from this cause, yet he had anticipated it in his plans, and provided for it. This he did by placing the engine and boiler on a slide bed, and furnishing it with suitable elastic buffing material to admit of the slight run forward, which might tend to take place at the moment of collision. The screw-propeller shaft would, in like manner, have a suitable tube-socket connection, which would allow the engine to slide forward, and yet keep up the integrity of the connection between itself and the screw-shaft. Mr. Nasmyth proposes to use no guns, but to content himself with the effects of the collision, which he enhances by the use of a powerful submerged percussion shell, which should strike the enemy several feet below water, and thus effect a ruinous breach, leaving her no chance of escape. He asks the Government to make experiments with such a vessel, and believes that a "covey of such chicks" would effectually preserve our coast from attack. The scheme of Admiral Sartorius differs from that of Mr. Nasmyth only in the addition of an armament of heavy guns to his vessel, and in the suppression of the percussion shell. He would of necessity require a large vessel; indeed, he himself proposes to cut down the *Great Eastern*, cover her with shot-proof iron plates, fit her with a screw at each end, arm her with heavy guns, and make a ram of her. I should add that he would build upon her towers, from which scalding water might be pumped upon boarders. My opinion is, that there is not a steam-ship in our navy, nor even a sailing ship, which, except in a dead calm, would not evade the blow of such a vessel. If a ship would lie at rest and wait for her, the gallant admiral's scheme would answer perfectly, but no long ship—which must necessarily occupy considerable time and space in turning—could be expected to answer the end which he assigns to her. Of the two schemes, Mr. Nasmyth's is by far the most promising; since, by excluding the armament, he could keep his vessel comparatively light and short, so as to be easily steered; but whether his percussion shell would be effective against the iron plates which

would, of course, be carried down to resist it, and, at the same time, leave his own craft unscathed, is a very doubtful matter.

Before quitting this branch of my subject, I ought to add a word on Mr. Macintosh's system of warfare, which Lord Panmure for a time forcibly suppressed. It consists in surrounding fleets or fortresses by floating naphtha, firing the same with potassium or otherwise, and thus enveloping the enemy in a cloud of vapour which either destroys him or drives him from his guns. This is not a mere theoretical proposition, made without consideration, the inventor having chartered a vessel during the war, and proceeded to the Black Sea with a cargo of naphtha for the purpose of attacking Sebastopol. His amiable intentions were frustrated by the indisposition of our admirals to adopt so vast an improvement!

Having now hurriedly reviewed the modern changes which our ships of war have undergone, and glanced at those floating suggestions which some are so eager to urge upon the Government, it will be well to consider for a moment a few facts bearing upon the immediate future of our navy. And, first, there cannot be a doubt that the Government can, if they please, hasten the introduction of great and radical changes. It is perfectly within their power to build ships of war of a far more destructive character than those which this or any other nation now possesses. But would it be politic for us to take the lead in such innovations? A navy like that which we possess involves, it should be remembered, the investment of an immense amount of capital. The cost of a ship of war when rigged and equipped may be estimated at £35 per ton, exclusive of the cost of her armament, and the engines involve a further expense of, say, £60 per nominal horse power. We have in our navy at the present moment 607 fighting ships, of an aggregate burden of 665,220 tons, and carrying engines of scarcely less than 100,000 horse power. Therefore our ships alone have cost us nearly £22,000,000; and upon their engines we have made a further outlay of nearly £6,000,000. Consequently, we have invested in these ships nearly £28,000,000. Now, any radical change in the construction of war ships must tend to render this enormous sum of money lost to us, and entail upon us a fresh expense of like or of greater amount. No other power has so large and expensive a navy, and, therefore, no other nation has so much to lose by sweeping changes. As good economists, we should not then be over hasty in developing new means of naval warfare in times of peace.

The defence of our coasts is, of course, at all times a legitimate subject of improvement, and no necessary pains should be spared in rendering that complete. But that may be best done by manning a sufficient number of the ships we have, rather than by devising new ones; and the existing Government will deserve great praise if they provide the means of doing this. There is no sign of weakness now visible in the navy of England save in its lack of men. The ships we possess carry no less than 15,140 guns, and could these be all discharged at once, would, at each round, project 254 tons of iron! In one day of twelve hours, firing but one round per minute, they would therefore project 914,000 tons, enough to form a solid cannon ball 120 feet in diameter. To fully man all these ships, and bring all their powers into play, we should require but 162,000 men, and if we had but a fair proportion of these to call upon in an emergency, our defence would surely be complete.

It will probably be objected by some that the French and Americans are building a new class of formidable vessels, and that we must, therefore, do the same. But the assumption of such objectors requires proof. The "ram's nest," lately discovered in America, is very much like another kind of nest which some people are very often finding. The "ram" that it contains need occasion no alarm. It has already cost the American Government 800,000 dollars, and a committee appointed to examine it is said to have reported that it will take 800,000 more to complete the operations begun. It is, therefore, exceedingly likely to remain in its nest for very many years to come; indeed, an American scientific paper some time since pronounced it fit only for exhibition to visitors, at three cents. a-piece, as a monument of folly. As to the French, they have, like ourselves, many inducements to refrain from great innovations. Where we have 60 steam line-of-battle ships they have thirty; where we have 330 steam-ships they have 220; and where we have 600 ships in all they have 400. Further, much that we have heard of their proceedings is not only false, but ridiculous. The rumour that they were building six *polished steel* frigates, by which some persons were recently plunged into deep distress, was manifestly put forth to excite our foolish fears; and statements less evidently absurd are doubtless often started with a like object. The French navy itself, though too costly to be thrown lightly aside, is greatly inferior to ours, as we have just seen; and the Emperor can be doing nothing that our Government are not advised of, and which they are not, therefore, at liberty to do

also; and, doubtless, would do, were it anything formidable. Certainly nothing yet made public need excite our apprehension. Give us a strong Channel fleet, liberally manned and well disciplined, and no power that the French, or any other Government, possesses would dare to menace our coasts; nor would any man venture to say, with Sir Francis Head, that nothing but the will of a foreign Emperor kept London secure from a foreign army.

Let it not be thought that the economical considerations before alluded to should be suppressed in the discussion of this topic. Certainly economy should not be carried so far as to cripple the Government in defending either Great Britain or its dependencies; nor should it be permitted to impede those researches and experiments which may be essential to the full and prompt development of our strength in time of war, should that arrive. But surely this country, with no offensive or aggressive ends to attain, and yet possessing a navy worth twenty-eight millions of money, and crowded, as it is, with a fearless and patriotic people, need not wince at every hostile whisper, or spend another million on war ships every time a foolish foreigner boasts; nor can it be amiss for such a nation to count the cost of so timorous a policy.

But if we are resolved on advancing at full speed in these matters, we have need to prepare ourselves for such navy estimates as we have never before known. For there never was a period when the art of naval warfare was more susceptible of change than it is at this moment. Fifty years ago the dimensions of vessels were, by common consent at least, limited; the power of our ordnance was practically stationary; the winds of heaven were our only propellers, and blew on all fleets equally. But now we build frigates much larger than the line-of-battle ships of that day, and know of nothing to hinder us from building them twice as large if we will. Our guns are incessantly improved,—now by one, now by another, and the breech-loading rifled cannon which Mr. Armstrong has just given us, and which ranges, I am told, four miles, may be quickly succeeded by another of twice its range. The paddle-wheel has made us independent of sails; the screw has made us independent of the paddle-wheel; and the 200 horse-power engine of the *Rattler* has been followed by the 1,000 horse-power engine which is to drive the *Mersey*, and that may speedily be replaced by one ten times its power. A single improvement in the manufacture of iron, which hundreds are now seeking daily to improve, may at any moment give us the means of carrying our steam pressure to unheard-of heights,* of resisting shells with the utmost ease, and of augmenting the strength of our ordnance tenfold. By eagerly arming ourselves with all the warlike agencies with which science may thus supply us, regardless of all consequences, we may certainly make our navy most terrible; but we shall at the same time, by the very preponderance of our might, compel all other powers, secretly at least, to make common cause against us, and thus prepare the way for universal strife. On the other hand, if we content ourselves with vigilantly observing the changes which other powers make, and adopting only such improvements as are necessary to keep alive that wholesome respect which all nations now feel for us, we shall neither encourage ambitious powers by our weakness nor alarm timid powers by our strength, but shall continue to stand a solid and impregnable bulwark, in the shelter of which men may peacefully work out their highest and noblest destinies.

The discussion which followed the reading of this paper will be reported in our next number.

ASSOCIATION OF FOREMEN ENGINEERS.

It is possible that a great number of the readers of the *Mechanics' Magazine* are not aware of the existence even, much less of the history and progress, of the London "Association of Foremen Engineers." It is our intention, therefore, to enter somewhat into particulars respecting that body. Everyone who knows anything of the great or minor engineering establishments of Great Britain will be aware of the care which is exercised usually in the selection of men to be entrusted with their practical management. It is of the first importance, indeed, to the heads of firms that the persons chosen to be their acting agents should be at once able, judicious, and economical. Without these qualifications, the superintendents of the multifarious operations ever going on in engine works and factories, and of the various artificers employed therein, would become involved in hopeless blunders and

* A simple but very important improvement in boiler plates, lately introduced by Messrs. Alton and Fernie, of Derby, deserves mention in this connection. It consists in thickening the sides of plates and bending the thickened parts to form the angles of boilers and other vessels, so that the ordinary plates may be riveted directly to the turned-down portion of the thickened plate without the use of angle iron. The full value of this invention it would not be easy to state. In addition to its direct advantages, it has the further one, doubtless, of getting rid of that unexplained, but very common cause of failure of boiler plates, not at the joints, but in their neighbourhood.—E. J. R.

difficulties, humiliating to themselves, harassing to the workmen, and ruinous finally to their employers. Foremen engineers generally, then, must be men of talent. Influence and interest may place men in positions of prominence, but in the engineering trade there must be ability in the recipients of such patronage to maintain those positions. Ninety-nine times out of a hundred, however, it will be found that favouritism has had nothing to do with the appointment of the non-commissioned officers, so to speak, of the great army of engineers. They are in the great majority of cases individuals who have in the early part of their career, "scorned delights and lived laborious days;" who have taken care to cultivate the natural gifts which they possessed zealously and carefully, and who have made themselves masters not only of the processes of manipulation connected with their art, but of the mathematical and scientific rules and principles upon which that art is based. In short, they are the representatives of the intellect of the mechanic class. They have, by dint of study, punctuality, and energy, raised themselves from the ranks, and taken honourable stations among their fellow-men; and they deserve, accordingly, that society should acknowledge their merit, and not withhold their well-earned meed of praise.

In our desire to place the body of men to whom the country is indebted for the practical carrying out of the innumerable triumphs of engineering genius and mechanical skill scattered so abundantly throughout England in a just and true light, we have digressed somewhat from the purpose with which we set out, and now hasten to return to it. The "Association of Foremen of the various Branches of the Engineering Trade" was established in London in 1852. As usual in the formation of such institutions, many obstacles were encountered by the few enlightened and benevolent men who in the first instance promulgated the notion of establishing this. Many meetings were held, and anxious discussions had, before it was deemed prudent to launch the idea into the tide of public opinion. At last, however, sufficient adhesion came from one quarter and another to embolden the promoters to appeal to the "brothers of their guild" in a more general way; and in 1852, as we have said, the Association became *un fait accompli.* Gradually it has received extended support, and it may be numbered at this hour among the scientific and philanthropic societies which are at once the pride and the mainstay of the industrial classes of the kingdom.

Without encumbering our pages with extracts from the printed rules of the Association, (copies of which may be readily obtained from John Jones, Esq., 7, Arlington-square, Islington, secretary,) it may not be amiss to shadow forth the purposes sought to be obtained by its means. The isolation which existed among foremen engineers prior to the creation of the Society, is urged as the principal evil to be overcome. Personally strangers to each other in most instances, they did not possess the power of justly recommending each other for the filling of vacant situations, nor was there any such thing as a fund from which those who happened to be unemployed could claim pecuniary aid. Similarity of position, circumstances, and feeling naturally gained mutual sympathy, but no tangible bond of fellowship was there through the medium of which that sympathy could be made practically valuable. "A fellow-feeling made them wondrous kind," but hitherto no machinery had been invented for directing that kindness to useful purpose, and individual, isolated, good feeling but "wasted its sweetness on the desert air." Out of these recognised and deplored wants sprang the conception of the Association in question. It essays to assist its members in fairly, creditably, and peacefully filling the important posts confided to them; to improve them intellectually through the medium of lectures, library, and discussions upon papers read at their monthly meetings; to relieve them when under the pressure of incidental difficulties and troubles; and it affords timely aid to their sorrowing families when the cold wings of death overshadow their hearths, and make their homes desolate.

Employers are invited to attend all its meetings, whereat the "politics" of the trade are never discussed, and "secrets" are at a discount. Briefly, it may be said that the Association of Foremen Engineers is a worthy assemblage of plain, though shrewd and clever men, with the express object of mitigating the evils incidental to their occupations, and of clearing for each other from the path of life the mental briars and brambles which encumber it, and make the human pilgrimage too often one of painful anxiety and care.

With so beneficent an aim in its view who can forbear wishing God-speed to the "Association of Foremen of the various Branches of the Engineering Trade;" and who will blame us for bringing its claims and its advantages before the notice of the mechanical world? At present the monthly meetings are held in the handsome assembly-room, Bay Tree Tavern, City, on the first Saturday in each month, at eight in the evening.

THE WEIGHING ROOM AT THE ROYAL MINT.

The weighing room at the Royal Mint is one of the handsomest and most interesting in that establishment. It is of noble proportions, and contains some beautiful machinery. Thirteen automaton balances have now superseded the hand labour of twenty men. These silent but almost infallible judges are ever holding court and passing sentence. All the gold and silver blanks, or discs of metal intended for coinage, are tried in the weighing room. A quantity is given to each automaton, and a self-acting apparatus carries forward one piece at a time to a tiny scale table so delicately poised that a human hair will readily turn it; and here its fate is decided. If too heavy, it at once descends through a flattened tube into a box for heavy work; if too light, into the receptacle for light pieces, and if medium then into the medium or accepted compartment. These admirable specimens of mechanical ingenuity, indeed, seem to do all but think, and are creditable to the inventor, the manufacturer, and the Mint. About thirty pieces of silver or gold may be weighed at each machine per minute, and they are enclosed in glass cases for fear of dust or moisture.

The British Workman. Yearly Part, No. 4. London: Partridge and Co., 34, Paternoster-row.

In its own sphere—which is, perhaps, the most important of all spheres—this publication is doing an immense amount of good. Conducted by earnest and devoted men, who avail themselves of the art of engraving more liberally than the editors of any other cheap paper that we know, it passes into the homes of thousands upon thousands of our poorer working men and women, and wins many of them from profligacy and abandonment to temperance and self-respect. It is a simple but strong agency, and is always exerted for moral ends. Let those who can afford it disperse widely among the poor, and especially among the intemperate.

THE AMERICAN CIGAR STEAMER.

To the Editors of the Mechanics' Magazine.

Gentlemen,—Presuming that the propeller of this vessel will be a *right-handed* screw, its effect on the water will be to draw more water into what may be termed the paddle-box from the starboard bow than the port, and to throw out more water towards the port-quarter than the starboard; thus causing the load-water line to become depressed on the starboard bow and rise on the port quarter. This will give the starboard side a tendency to lower, but as this tendency will be in opposition to the turning thrust of the engine on the propeller, it may be so far beneficial. This irregularity of the load-water line will, however, cause the vessel to turn to port, which must be counteracted by keeping the helm slightly a-port. The action of the propeller would drive the vess e sideways, *if there were no case* or paddle box, but the sideway motion will thereby be prevented, just as an ordinary paddle steamer would be unable to move with her wheels similarly enclosed.

The statement that her water lines are all similar is erroneous. Her load-water line will diffe with every inch of immersion; her vertical lines will improve as she gets lighter, while her horizontal lines will become bluffer, and her load-water line can only be made sharp by making her draw 8 feet.

From the diagrams, I think her constructors will be disappointed with her appearances when "displacing 350 tons of water," as the two points of the cigar would then be *under* water, in which trim no man in his senses would venture in her to sea. In fact, if she draws more than six feet water she will be in danger of plunging *under* a wave instead of over it, and at that draft her displacement will be too small to be useful.

Her constructors appear to have aimed chiefly at simplicity of design, regardless of the many other important qualities requisite in a ship, and, as a matter of course, have produced an absurdity.

I am, Gentlemen, yours, &c.,

T. Moy.

1, Clifford's-inn, 7th Dec., 1858.

EXPERIMENTS WITH WHITWORTH RIFLE CANNON.

On Saturday, the 4th inst., the third and last iron Whitworth gun, termed a 32-pounder, but really only of the bore of a 12-pounder, weighing 72 cwt., was tested at Shoeburyness, and burst at the ninth round with a charge of five pounds of powder only. This is a sad result, after so much public money has been expended.

SHIPS' PUMPS.

In deference to our expressed desire that the correspondence on this subject should be discontinued, our correspondent "J.S.H." declines to pursue it, but requires that Mr. Roberts's objections to his calculated results should be noticed, either by himself or by us; we therefore state that "J. S. H." has forwarded to us the formula he used, and the calculations in full, both of which we have carefully gone over, and find as follows:—If the pump had really filled the tank as described, then, on the supposition that it had a loss of five per cent., it would have pumped 18·886 per cent. more than was possible; and, on the supposition that it had a loss of ten per cent., it would have pumped 25·49 per cent. more than was possible. "J. S. H." called these numbers 19 per cent. and 25½ per cent., and these figures were challenged by Mr. Roberts. But they were manifestly used for convenience, in order to avoid decimal fractions, and they are so near the truth as to render the use of them perfectly justifiable.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

. The following abstracts of specifications of Patents recently filed, up to No. 837, should have appeared in last week's Magazine before those which were there published.

Pye, G., R. Smith, and B. Croasdale. *Improvements in looms.* Dated Apr. 14, 1858. (No. 802.)

The patentees employ tappets to give motion to treddles placed in the interior of the loom, which treddles draw down hooks attached to the healds, for making a shed to the pattern required. The hooks are pushed under the treddles by pegs on pattern cylinders, and are held off by springs. Motion is given to each pattern cylinder by a worm wheel on its shaft working into a worm on the tappet shaft. When two treddles are used, their ends are attached by a band, &c., to a pulley or drum, so that when one is pushed down the other rises, the healds being attached to quadrants, or to jacks and springs.

Holmes, W. C., and W. Hollingshead. *Improvements in the manufacture of metal castings.* Dated Apr. 14, 1858. (No. 803.)

This consists, 1. In the use of steam, hot air, or hot water, in casting metals in metallic moulds. The moulds have an external case, between which and the moulds is a space through which steam, &c., pass by pipes placed in, and heated by, a furnace. The steam, &c., are conducted through the chambers of the mould previous to the molten metal being run into the mould, which raise the temperature thereof. The transmission of the heating media through the chamber is continued during the whole process of coating, its action being, (1.) To raise the temperature of the mould. (2.) To carry off the heat transmitted to the mould by the molten metal, thus preventing the mould from becoming too hot, and being destroyed by the molten metal adhering thereto. The process of casting is thereby rendered continuous. 2. In the use of superheated steam or hot air for drying cores and sand moulds for castings, by placing them in a vessel having a jacketing for passing the steam into or through it so as to raise the temperature of such vessel, and envelope the cores or moulds in an atmosphere of steam.

Mennons, M. A. F. *Certain improvements in voltaic batteries.* (A communication.) Dated Apr. 14, 1858. (No. 805.)

This consists in the use of lead in the construction of voltaic batteries in substitution for zinc or other oxidisable metal.

Gorham, J. *Improvements in optical instruments by the revolution of which various designs or patterns may be produced to the eye.* Dated Apr. 14, 1858. (No. 806.)

This consists in combining with the optical instruments known as colour tops, the use of a disc with a hole in the centre sufficiently large to cause it to fit loosely on the spindle of the top, but only so large as to admit of its vibrating to a small extent, such disc having appended at or near its circumference a light weight, for slightly retarding its motion with the top, and causing it to vibrate on the spindle of the same on which it is placed during its revolution. Thus the disc is made to revolve about the same axis, and in the same direction as the top, and in a plane parallel therewith, but at a short distance from it, and with a motion retarded as to its velocity, while as to its direction the motion is broken up into a series of rapid jerks. This disc is blackened on its upper surface, and has a device cut through it, so as to admit of the colours on the surface of the ordinary colour top or wheel being seen through such device when viewed from above. It results that if the colour top or wheel rotates vertically, then the vibrating disc occupies a position in front of the wheel, that is, between it and the eye in all cases.

Gray, J. *Improvements in ploughs.* Dated Apr. 14, 1858. (No. 808.)

This consists in forging the body or body frame of the plough and the head in one piece. The beam and stilt may also be made in the same piece. The body and body frame of the plough, and the parts formed in the same piece with it, are made of either wrought iron or steel. An intermediate piece, termed a socket, made of wrought iron or steel, is introduced between the sock or share of the plough, and the head, and the sock or share, are made of cast iron, wrought iron, or steel. The cutter is fixed to the beam of the plough by a loose wrought-iron clamp. And there is an adjustable bridle adapted to the bar to which the drag plate is jointed.

Mather, C., and H. Charlton. *Improvements in apparatus for drying cotton, linen, wool, yarn, seed, and other articles.* Dated Apr. 14, 1858. (No. 809.)

On the interior of a chamber there are two parallel partitions which extend nearly to the roof. At the lower part of the chamber, and between the two partitions, is a floor perforated with numerous holes, and below is a space which communicates with a chimney, through which is a powerful draft. In the two spaces between the outer walls and the two partitions are gas burners, which heat the air in such spaces. The heated air ascends to the roof, and descends to between the two inner walls or partitions, and passes through the perforated floor. When yarns, &c., are to be dried, a series of rollers are arranged within the chamber between the partitions which conduct the yarns, &c., through the chamber in tortuous directions, either inclined, horizontal, or vertical. When other articles or seeds are to be dried, they are to be placed on perforated trays. The chamber has an opening into it, which is closed by a door. When yarns, &c., are dried, they are caused to enter through a narrow opening, and to leave through another narrow opening, so that a continued succession of yarn, &c., may be caused to circulate within the chamber.

Green, E. *Improvements in implements for harrowing, pulverizing, cleaning, and breaking up land.* Dated Apr. 14, 1858. (No. 810.)

This invention was described and illustrated at page 420, No. 1838, vol. 69.

JOHNSON, J. H. *Improvements in sewing machines.* (A communication.) Dated Apr. 14, 1858. (No. 811.)

This relates to sewing machines wherein a locked or two-thread stitch is produced. A lateral vibratory motion is imparted to the needle arm and shuttle race in contrary directions; and an upward and downward motion is also imparted to the needle (which is curved) simultaneously. A discoidal shuttle is used, fitted into a concave shuttle race, which is carried by the lower portion of the rocking frame. An adjustable plate with forked projections is used for retaining the shuttle in its proper position laterally, and it is prevented from jumping in the race by a slight spring upon the thread spool, the spring serving to maintain the spool within its shuttle or case. The feed motion is imparted to the cloth by the lateral vibratory motion of the needle.

KNIGHT, J. *Improvements in machinery or apparatus for scouring, washing, and cleansing textile fabrics.* Dated Apr. 14, 1858. (No. 812.)

This relates to a previous patent of the patentee, dated 3rd Mar., 1845, and consists, 1. In making the sides of the chambers described in the previous specification corrugated. 2. In securing and closing the openings through which fabrics are placed in and withdrawn from the chambers steam-tight. 3. In arrangements by which a determined measure of liquor may be admitted into the chambers of the cylinder.

NEWTON, A. V. *Improvements in rotary pumps.* (A communication.) Dated Apr. 14, 1858. (No. 813.)

This relates to that class of hydraulic engines which have two heads or pistons revolving within an inclosing case. The inventor employs, 1. A form of revolving turn-piston calculated to effect the maximum delivery of water from a chamber of given dimensions. 2. Certain forms of compensating packing for the peripheries and ends of the pistons. The improvements cannot be described without engravings.

PRESTON, F., and W. MCGREGOR. *Improvements in machinery for forging and cutting files.* Dated Apr. 15, 1858. (No. 815.)

This invention was described and illustrated at page 505, No. 1842, vol. 69.

COWELL, L. *An instrument or nippers for cutting the wired, corded, or like fastenings of corked bottles.* Dated Apr. 15, 1858. (No. 817.)

This consists of an instrument formed on the principle of nippers to clasp the cork of a bottle on each side close to the bottle neck, with two serrated or plain semicircular cutters, which the operator can cause to press on and cut the wire or cord, on all sides simultaneously, by pressing the handles of the nippers, and wrenching them round. The two handles may be jointed at one end, and a portion of each curved to a semicircle of the required size, which will generally be about equal to the bore of the bottle neck, so as not to cut the cork in the act of cutting the wire or other fastenings.

MEYERS, J. *Improvements in the treatment of dark fur skins, in order to render them more highly ornamental.* Dated Apr. 15, 1858. (No. 818.)

This consists in inserting within or upon such skins small spots, patches, tufts, or tails of white or light-coloured fur, furskins, feathers, down, or such like material.

SPENCE, W. *Improvements in the pedestals and journal boxes of railway carriages.* (A communication.) Dated Apr. 15, 1858. (No. 819.)

This consists, 1. In constructing the pedestal and grease box respectively so as to admit of the latter being easily removed. 2. In actuating the lubricating roller by means of the concussions of the axle. 3. In inserting in the opening through which the axle enters the box what has been called a compensating washer, for the purpose of closing such opening against the escape of grease or the admission of dust.

NEWTON, W. E. *Certain improvements in boots, shoes, and other coverings for the feet.* (A communication.) Dated Apr. 15, 1858. (No. 820.)

These consist in forming soles or half-soles of a shell of wire cloth or gauze, covered with vulcanised india rubber, &c., the whole being moulded by pressure. 2. In stiffening the back of the heel part of clogs and goloshes by applying a spring of steel, hard india rubber, &c., which will bear against the upper leather of the boot or shoe, and, by a pin attached either to the heel or the spring of the clog, prevent the clog from coming off accidentally. 3. In making them with only a small portion of upper, to prevent their confining perspiration.

HARRIS, J., and T. SUMMERSON. *An improvement in railway chairs.* Dated Apr. 15, 1858. (No. 821.)

This consists in forming recesses on the under sides of chairs, to receive hollow pieces of wood through which and through the upper surfaces of the chairs the bolts are driven, so that the wood forms bushings around the bolts. The recesses for holding the wood are of larger diameter than the holes through the upper surfaces of the chairs, so that the wood cannot be drawn through from the under surfaces of the chairs.

DURANT, A. H. A. *An improved apparatus for husking and winnowing castor (and other) seeds and berries.* Dated Apr. 15, 1858. (No. 822.)

This consists of a perforated paddle-wheel or fan attached to an axle, that by the application of power the seed or berries, when falling through feeders upon the paddles acting in an opposite direction, are husked and winnowed by the centrifugal force so applied.

BROTHERHOOD, P. *Improvements in the construction of locomotive and other steam boilers.* Dated Apr. 16, 1858. (No. 825.)

This consists in placing between the fire-box and the ordinary flues or tubes of steam boilers, a combustion chamber connected to the fire-box by tubes surrounded by water. Between the fire-box and combustion chamber there is an air-tube surrounded by water, open at both ends for the admission of air, and communicating with the combustion chamber, through a number of small tubes (also surrounded by water), by which means the air is brought into contact with the flame and smoke entering the combustion chamber.

BROWN, G. G. *Improvements in ships' binnacles.* Dated Apr. 16, 1858. (No. 826.)

This invention was described and illustrated at page 446, No. 1839, and at page 492, No. 1841, Vol. 69.

WALKER, G. *An improved union apparatus for cleaning and polishing knives and forks, and boots and shoes, and which said apparatus is also applicable for sharpening or cleaning other articles.* Dated Apr. 16, 1858. (No. 827.)

This consists in placing any number of discs upon a spindle or shaft, to be worked either vertically or horizontally, and distributing over their surface, in a radial or other direction, leather, felt, bristles, &c., for polishing and cleaning.

MOORE, D. *An improvement in fire tongs.* Dated Apr. 20, 1858. (No. 867.)

This consists in the use of a curved slide attached to the inner part of one of the legs receiving a tongue on the inner part of the other leg, by which the parallelism in the movements of the ends of the tongs is maintained, ensuring a correct hold on any article seized by the tongs, and is also out of the way in handling the tongs.

ROSS, M. *Improvements in the manufacture of frames for looking-glasses, pictures, and other representations.* Dated Apr. 21, 1858. (No. 873.)

This consists in the adaptation of glass, porcelain, and earthenware for the above purposes.

COPCUTT, J. *Improvements in the manufacture of gas, and in the apparatus employed therein.* Dated Apr. 21, 1858. (No. 874.)

The patentee combines oil or grease with a small quantity of camphor dissolved in naphtha, and distils gas from such combined matters. The

apparatus consists of a retort, the bottom of which is covered with stones. The oil is fed in by a funnel on a pipe, which it is desirable to bend into two coils or hoop-like bends. The products, as they arise, are passed by a descending pipe below the surface of red-hot melted metal contained in a close vessel, rise up through such metal, and then pass away for use. When purifying by liquids, such as lime water, the gas is conveyed in a pipe to nearly the bottom of the vessel, and there escapes into the fluid contained in the vessel. The gas, however, is not allowed to ascend directly through the liquid, but by a number of discs at intervals apart affixed to the descending pipe, is deflected off towards the sides, then towards the pipe, and then towards the sides, and so on, till it arrives at the outlet pipe. The purifying liquid is kept constantly to the desired level by a syphon pipe, and fresh liquid is introduced by a funnel and descending pipe. In order to give to gas greater and improved lighting power, the patentee causes it, before it arrives at the burner, to pass in contact with camphorated ether.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

*** The following abstracts of specifications of Patents not proceeded with, should have appeared in last week's Magazine, before those which were there published.

Armstrong, R., and J. Galloway. *Improvements in apparatus and furnaces for heating, welding, or melting metals, parts of which improvements are applicable to other furnaces.* Dated Apr. 14, 1858. (No. 801.)

In applying the improvements to an ordinary reverberatory forge furnace the inventors increase the height of the chimney to about 48 ft. to improve the draught, and enable them to work with thicker fires. The gases are consumed by air admitted above the fuel. They erect upon the top of the furnace a series of parallel channels of brickwork, forming a hot-air drain, through which a constant supply of air is admitted in thin streams, and is thence passed through apertures into the grate-room for effecting the combustion of the carbonic oxide, &c. They also admit a limited amount of air through a register in the front wall of the fire-place through a passage called the cold-air drain. There are two or more feeding mouths through which the coals are pushed forward on to the grate, by pistons moved in two rectangular channels by screws. The whole set slope towards the fire-grate at an angle of about 15°, to leave room for manipulating with the fire-bars under the feeding mouths of the retorts. The inventors describe other additions to, and modifications of, the details of the furnace.

Mennons, M. A. F. *Improvements in obtaining motive power, and in apparatus connected therewith.* (A communication.) Dated Apr. 14, 1858. (No. 804.)

This consists in employing compressed air in combination with water for obtaining motive power, and in certain apparatus connected therewith, which cannot be described without engravings.

Osborne, T., and R. A. Bell. *An apparatus for suddenly detaching railway carriages or wagons.* Dated Apr. 14, 1858. (No. 807.)

This consists of a shaft running under each carriage, which communicates with levers that act upon a pin working in a slot in the guide. This pin when in position comes under the link of the coupling chain, and in its turn acts upon it. The shaft is worked by a handle which, when pressed down, causes the pin to ascend in the slot in the guide by the aforesaid mechanism, whereby the link of the chain on the draw hook is pushed off.

Davies, C., W. Jones, and J. Jones *An improved method of finishing tinned, terne, or lead plates, without the use of grease.* Dated Apr. 15, 1858. (No. 814.)

This consists in the use of hot air instead of hot grease. The plates to be finished are placed in a stove of iron or brickwork instead of being immersed in a grease pot.

Thomas, F. S. *An improved mode of propelling carriages upon railways.* Dated Apr. 15, 1858. (No. 816.)

The inventor employs an arm or propeller acted upon by the flange of the wheels of each carriage in succession, by which means the weight of each carriage is transferred as a motive power to the perpendicular arm, which, acting against the catch or block, causes the weight of the carriages to effect wholly or in part the propulsion of the train.

Boot, A. J. *Improvements in machinery or apparatus for making labels.* Dated Apr. 16, 1858. (No. 823.)

The inventor uses case-hardened type to represent the letters, &c., to be impressed on the labels, and places the same in a box or frame, keeping the type in position by wedges or screws. He makes a base plate with a mould to contain the label, and fixes set screws in the base plate to adjust it to a level surface. He fixes the box or frame containing the type over the blank label, and by a screw or lever gives the necessary pressure to stamp the type on the label. He then places the label between two surface plates, and gives the necessary pressure to take off any roughness, &c., which may exist.

Hodges, J. G. *Improvements in machinery or apparatus for embroidering.* Dated Apr. 16, 1858. (No. 824.)

The inventor arranges a surface table and a number of needles according to the pattern required, the needles operating vertically or horizontally, and being fed with thread or silk, &c., from a corresponding number of spools or bobbins in a similar manner to the ordinary sewing machine. He causes the needles to move up and down, or to and fro, by levers or cranks, governed either by a cam for each needle, or a cam for the whole number, and put in motion by the turning of a wheel and shaft, either by hand or power, so that all the needles act simultaneously. To cause the diversity of pattern he causes the table to move in any direction by connecting it with a pattern model; or the table may be stationary, and the needles by their change of position may give the required pattern.

PROVISIONAL PROTECTIONS.

Dated August 30, 1858.

1956. F. Brignoles, of Torrington-sq. Improvements in apparatus for the disinfection and rectification of bad-tasted alcohols, by the separation of the essential oils from the alcoholic exhalations. A communication from St. Cyr Prieur, of Avignon.

Dated November 9, 1858.

2502. E. E. Allen, of Brompton-row, engineer. Improved machinery or apparatuses for working the propellers of vessels.

Dated November 12, 1858.

2540. J. G. Martien, of Ampthill-sq., gentleman. Improvements in the manufacture of iron, and in the apparatus employed in such manufacture.

Dated November 19, 1858.

2610. P., E., and J. Marchand, of Dunkirk, France. A new process for refining lamp oil.

2612. W. S. Hayward, of Abingdon, Berks, gentleman. Improvements in the manufacture of a glutinous and viscous substance or dextrine, to be used in the manufacture of paper, and in dressing textile fabrics, by which greater tenaciousness, smoothness of surface, and body are obtained.

2614. S. C. and J. Leach, of Manchester, machinists. Certain improvements in the construction of "self-acting temples," to be employed in looms for weaving.

2616. W. Hancock, of Upper Chadwell-st., gentleman. Improvements in the manufacture of electric telegraph wires and cables.

2618. H. H. Henson, of Parliament-st., Westminster. Improvements in waterproofing fabrics or materials.

2620. E. A. Pontifex, of Shoe-lane, engineer and coppersmith. Improvements in external surface condensers.

2622. W. Clark, of Chancery-lane. Improvements in purifying natural phosphates of lime. A communication from E. C. Martin, of Paris.

2624. J. E. F. Luedeke, of Marke, Hanover, engineer. Improvements in motive-power engines.

2628. J. Easton, sen., and C. E. Amos, of the Grove, Southwark, engineers. Improved apparatus applicable to drains, sewers, and watercourses, for the purpose of removing extraneous solid matters therefrom.

2630. T. S. Cressey, of Homerton. Improvements in machinery used in the manufacture of casks.

Dated November 20, 1858.

2632. J. Wadsworth, of Salford, machinist. Improvements in gas burners, and in the means or methods of and in apparatus for moderating or retarding, regulating, or governing the flow and pressure of gas used for purposes of illumination, and in street lamps or lanterns for shielding flame from the action of wind and rain.

2634. D. Rowan and S. Robertson, of Greenock, engineers. Improvements in steam engines.

2636. C. Tomlinson, of Wolverhampton, accountant. Improvements in stop taps or valves.

2640. H. Jordan, of Liverpool, ship builder. Improvements applicable to navigable vessels.

2642. L. Percivall, of Birmingham, manager, and J. Houghton, of Edgbaston, glass merchant. Improvements in attaching knobs of glass, china, and earthenware, to the spindles of locks and latches, and to drawers and other articles.

2644. H. Swan, of Bishopsgate-without. Improvements in stereoscopes and other optical instruments, and in stands or supports for stereoscopes.

2646. H. Gardiner, of New York, mechanical engineer. Improvements in the compound axle hub and wheel for railroad cars.

Dated November 22, 1858.

2648. R. Nelson, of New York, mariner. Improvements in apparatus for raising and lifting water and other liquids.

2650. S. W. Johnson and J. Varley, of Peterborough, engineers. Improvements in pressure and vacuum gauges.

2652. E. H. Bentall, of Heybridge, Essex, Ironfounder. An improvement in the construction of turnip cutters.

Dated November 23, 1858.

2654. W. Ralston, of Manchester, engraver. Improvements in embossing and finishing woven fabrics, and in the machinery or apparatus employed therein.

2655. W. H. Dawes, of West Bromwich, ironmaster. An improvement in forge hammers, and in the anvils used with forge hammers and squeezers.

2656. W. Gorman, of Glasgow, engraver. Improvements in furnaces and in the combustion of fuel, and in apparatus connected therewith.

2657. J. Fairweather, of Dundee. Improvements in weaving bags, sacks, and other tubular fabrics.

2658. N. F. Boréiko de Chodzko, of Paris. A smoke-preventing apparatus.

2659. A. V. Newton, of Chancery-lane. Improvements in retorts for generating illuminating gas. A communication.

2660. A. V. Newton, of Chancery-lane. Improved machinery for sweeping floors. A communication.

2661. W. Warne, J. A. Jaques, and J. A. Fanshawe, of Tottenham, india rubber manufacturers. An improved fabric, applicable for covering floors and walls, and for other analogous purposes.

Dated November 24, 1858.

2662. R. H. Hughes, of Hatton-garden, engineer. Improvements in means or apparatus employed when lighting by gas.

2663. R. A. Brooman, of 166, Fleet-street, London, patent agent. An improvement in cigar cases. A communication from G. Scriba, of Paris.

2664. Sir C. Shaw, of Old Cavendish-st., brigadier-general. Improvements in the construction of ball and bullet proof shields or mantlets.

2665. W. E. Newton, of Chancery-lane. Improvements in mills for grinding corn. A communication.

2666. A. V. Newton, of Chancery-lane. Improved machinery for making bolts and rivets. A communication.

2667. R. H. Hess, of Islington, engineer. A new manufacture of articles, parts of articles, parts of machinery, surfaces, and ornamental works from talc and other silicates of magnesia.

2668. C. Peterson, of Isle of Wight, gentleman. Improvements in the manufacture of paper cartridges, and in paper applicable for water-proof purposes.

2669. J. S. Nibbs, of Aston, Warwick, lamp maker. Improvements in lighting, heating, and ventilating.

2670. J. H. Johnson, of Lincoln's-inn-fields. Improvements in the employment of electricity as a motive power. A communication.

Dated November 25, 1858.

2671. C. E. Amos, of the Grove, Southwark, engineer. Improved apparatus for raising and supporting ships or vessels while undergoing repair, which apparatus is also applicable for facilitating the passage of ships or vessels over bars, sandbanks, or in shallow waters.

2672. F. C. Calvert, of Manchester, professor of chemistry, and C. Lowe, of the same place, analytical chemist. Improvements in the manufacture of size.

2673. H. Eastwood, of Elland, near Halifax, machine maker. Improvements in purifying gas for illuminating purposes.

2674. R. Bodmer, of Thavies-inn. Improvements in valves for regulating the supply of steam. A communication.

2676. C. F. Vasserot, of Essex-st., Strand. An improved petticoat and bustle. A communication from A. Braconnier, of Paris.

2677. J. Nuttall, of Old Accrington, beer retailer, G. Riding, of Clayton-le-Moors, medical botanist, and W. Coulthurst, of Old Accrington, chemist, all in Lancaster. Improvements in sizes for sizing cotton, linen, or other warps or yarns for weaving.

2678. F. H. Maberly, of Stowmarket, master of arts. Improvements in candlesticks.

2679. C. Parker, of Dundee, engineer. Improvements in looms for weaving.

2680. F. Loos, of Mercer-st., Long-acre. Improvements in gas regulators.

2681. C. Mather, of Salford, machinist. An improved steam trap or apparatus for allowing the escape of water and air from pipes, vessels, or chambers heated by steam.

2682. W. Burton, of Bethnal-green, manufacturer. Improvements in preparing colouring matter for dyeing.

Dated November 26, 1858.

2683. J. Luis, of Welbeck-st. A new sort of drawers or trousers for ladies or children. A communication from C. Gobert.

2685. E. Dixon, of Wolverhampton, manufac-

turer, and J. Fisher, of Wolverhampton, tube drawer. An improvement in the manufacture of welded iron tubes.

2687. M. Meyers, of Great Alie-st., umbrella maker. Improvements in parasols.

2689. G. Richardson, of New Broad-st., metal merchant. Improvements in machinery or apparatus for pressing bales of goods. A communication.

2691. J. B. Booth, of Preston, spindle manufacturer. Improvements in machinery or apparatus for preparing, spinning, doubling, and winding cotton and other fibrous materials.

2693. P. Griffiths and J. Brennand, of Burnley, engineers. Improvements in lubricators for introducing lubricating matter into steam cylinders and other chambers or parts under pressure.

Dated November 27, 1858.

2695. J. Tangye, of Birmingham, machinist. An improvement in hydraulic presses.

2697. G. Collier, of Halifax, engineer. Improvements in means or apparatus employed in weaving.

2699. F. C. Kinnear, of Hoxton, and D. Posener, of Windmill-st., Haymarket. Improvements in the means of preserving life and property in navigation.

2701. C. Burrell, of Thetford, engineer. Improvements in traction engines and carriages.

2703. W. Tillie, of Londonderry, shirt manufacturer. An improvement in the manufacture of shirts and shirt fronts.

2705. H. Gerner, of Bayswater, civil engineer. Improvements in the mode of and apparatus for manufacturing gas for illumination and heating.

Dated November 29, 1858.

2707. G. Oates, of Sheffield, scissors maker. Improvements in the manufacture of scissors. A communication.

2709. F. S. Perrare-Michal, of Paris, gentleman. Improvements in the manufacture of bridles (without bits and without curb-chains) for riding, driving, or otherwise conducting horses.

2711. W. E. Newton, of Chancery-lane. Improved expansion, or cut-off gear, for steam engines. A communication.

2713. W. Parsons, of Bittern, near Southampton, bricklayer. Doing away with the smell arising from the melting fat, tallow, &c., and also for an improvement in stirring and straining the same.

2715. J. Lea and W. A. Sherring, of Cecil-court, St. Martin's-lane. Improvements in the treatment of vegetable fibres for the manufacture of paper, spinning, and other purposes.

2717. J. H. Johnson, of Lincoln's-inn-fields. Improvements in locomotive engines. A communication.

2719. L. A. Normandy, jun., of Judd-st. Improvements in manufacturing files. A communication.

2721. J. Gresham, of Hull, Esq. Improvements in apparatus for preserving ships' papers, and other papers and writings, in case of the loss of, or accident to, a ship whilst at sea.

2723. D. Evans, of New Town, Stratford, and G. Jones, of Upper Kennington-lane, engineers. Improvements in pumps and water gauges.

Dated November 30, 1858.

2725. J. Luis, of Welbeck-st. A new railroad with continued supports splintered together without any wood being used. A communication from L. Barroux.

2727. A. Marks, of London-wall, general trimming maker. Improvements in the manufacture of braided articles.

2729. J. Thow and T. M. Hall, of Preston, engineers. Preventing the fusion of the fire bars in locomotive or other furnaces.

2731. G. Boccius, of Totnes, Devon, gentleman. Improvements in the construction of furnaces.

2733. J. Colyer, of Leman-st., cooper and backmaker. Improvements in machinery and apparatus for cutting and shaping staves and other parts of casks.

Dated December 1, 1858.

2735. A. Stenger, of Gresham-st., commission merchant. Improvements in the manufacture of cravats, braces, belts, and waistbands.

2737. J. Loach, japanner, and J. Cox, electroplater, of Birmingham. Certain improvements in ornamenting the surfaces of japanned goods, and which said improvements are also applicable to the ornamenting of certain other surfaces.

2739. T. P. Pursglove, of Battersea. An improved pressure gauge for steam, gas, or other fluids.

2741. C. F. Vasserot, of Essex-st., Strand. An apparatus for printing with different colours thread to be applied to the manufacture of textile fabrics. A communication from A. Lequint, of Amiens.

2743. E. Viney, of Cornhill, portmanteau maker. An improvement in the construction of portmanteaus, desks, dressing cases, despatch boxes, and other like articles.

2745. F. Warner, of Jewin-st., J. Derbyshire, of Longton, Stafford, and A. Mann, of Little Britain. An improvement in the manufacture of cocks or taps.

2747. H. Bessemer, of Queen-st.-pl., New Cannon-st. Improvements in railway and other wheels and wheel tyres.

2749. A. E. Davis, of Vauxhall, and R. Wright, of Camberwell. Improvements in the manufacture of colouring matter for spirits and other liquids.

2751. L. Bissell, of New York. Improvements in trucks for locomotive engines.

2753. E. L. Benzon, of Sheffield, steel manufacturer. The manufacture of useful alloys of aluminium. A communication.

PATENT APPLIED FOR WITH COMPLETE SPECIFICATION.

2809. M. A. F. Mennons, of Paris. An improved apparatus for ascertaining and registering the work of certain kinds of lever balances. A communication. Dated Dec. 7, 1858.

NOTICES OF INTENTION TO PROCEED.

(From the "London Gazette," December 14th, 1858.)

1726. J. Davey, H. Sims, J. Mayne, W. Hodge, and J. Gerrans. Valve.

1736. H. Conybeare. Laying cables.

1737. H. Conybeare. Generating and superheating steam.

1759. J. Steel. Brewing and distilling.

1760. G. Bell. Embossing.

1766. C. Callebaut. Sewing machines.

1768. J. Taylor. Hydraulic machines.

1780. W. Moseley and W. S. Champness. Penholder.

1781. E. Leigh. Spinning.

1784. C. Mather. Shearing machines.

1791. G. H. Bovill. Gas; fuel.

1794. S. Carey. Permanent way, &c.

1795. G. Weston. Washing machine.

1797. J. Walker. Telegraph cables.

1798. J. Webster. Metallic alloy.

1799. J. Smith, jun. Steam engines.

1802. J. Imray. Printing.

1803. J. Taylor. Blocks for sewers and drains.

1804. J. Walker. Moulding metals.

1806. A. V. Newton. Piano-fortes. A communication.

1820. R. H. Collyer. Coating composition.

1821. F. Haeck. Cocks and taps.

1824. J. T. Pitman. Lifting and pressing. A communication.

1832. W. Knowles. Spinning.

1843. H. Smith and T. W. Ashby. Haymaking machines.

1849. T. Rickett. Locomotive engines, &c.

1858. J. Smith and S. A. Chease. Motive power.
1868. L. A. and E. I. B. Herrmann. Connecting pipes; regulating flow of fluids.
1942. W. Esson. Wet gas meters.
1967. L. Wiart. Generating steam.
1981. P. D. Margesson. Treating sugar cane, &c.
2005. R. A. Brooman. Apparatuses for containing and delivering liquids. A communication.
2106. J. Luis. Applying centrifugal force. A communication.
2130. R. A. Brooman. Printing shawls. A communication.
2156. C. Hall. Applying power to cultivating the soil.
2463. G. P. Evelyn. Stocks of fire-arms.
2482. A. Fryer. Supplying boilers with water.
2498. W. Smith. Hauling ploughs.
2552. I. Livermore. Shuttlecocks.
2598. S. Riley. Hats, &c.
2609. B. Rider. Ventilating hats.
2616. W. Hancock. Telegraph cables.
2618. H. H. Henson. Waterproofing.
2625. W. Marshall. Steam engines.
2628. J. Easton, sen., and C. E. Amos. Drains, &c.
2632. J. Wadsworth. Gas burners.
2643. J. Young. Window sashes.
2667. R. H. Hess. Articles made from talc.
2672. F. C. Calvert. Size.
2681. C. Mather. Steam trap.
2739. T. P. Purssglove. Pressure gauge.

The full Titles of the Patents in the above List can be ascertained by referring back to their numbers in the Lists of Provisional Protections previously published.

Opposition can be entered to the granting of a Patent to any of the parties in the above List who have given notice of their intention to proceed, within twenty-one days from the date of the Gazette in which the notice appears, by leaving at the Commissioners' office particulars in writing of the objection to the application.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

2768. H. Bessemer.
2781. J. Cocker.
2785. P. A. de Fontainemoreau.
2792. J. E. de Malbec.
2796. J. Cliff.
2797. J. H. Johnson.
2820. J. H. Johnson.
2821. J. H. Johnson.
2847. J. L. Jeffree.

LIST OF SEALED PATENTS.

Sealed December 10th, 1858.

1325. J. Gemmell.
1353. W. P. Wilkins.
1391. H. Becu.
1433. C. Nightingale.
1439. P. M. Crane.
1477. W. Clark.
1496. E. Lord.
1488. A. V. Newton.
1911. M. R. Pilon.
2177. L. Cecconi.
2268. W. E. Newton.
2284. J. Braby and J. Braby, jun.

Sealed December 14th, 1858.

1342. H. J. Daniell.
1344. G. Neall.
1348. C. C. J. Guffroy.
1354. Sir F. C. Knowles.
1355. H. S. Warner.
1361. C. W. Lancaster.
1363. J. J. Cregeen.
1364. J. H. Dickson.
1419. R. Armstrong.
1574. G. Buchanan.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions.

NOTICE TO CORRESPONDENTS.

Articles and Correspondence designed for insertion in the ensuing Numbers of the *Mechanics' Magazine* must reach the Office by the Tuesday of each week, at the latest. It is highly desirable that they should be forwarded earlier if possible.

CONTENTS OF THIS NUMBER.

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BELL'S PATENT IMPROVEMENTS IN THE MANUFACTURE OF IRON.

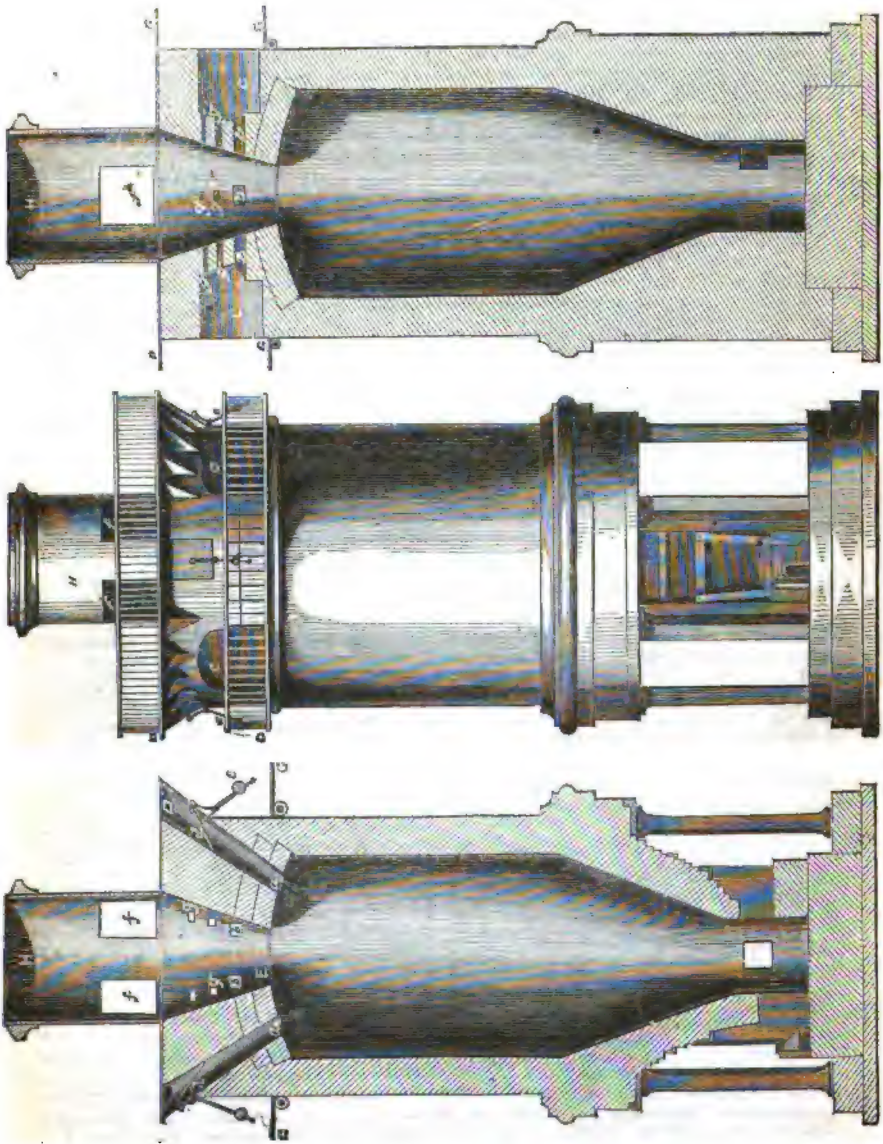

Fig. 3.

Fig. 2.

Fig. 1.

BELL'S PATENT IMPROVEMENTS IN THE MANUFACTURE OF IRON.

Mr. I. L. Bell, of the Washington Chemical Works, Newcastle, gives the following description of certain improvements in the manufacture of iron recently patented by him:—

"In the present mode of working iron smelting furnaces there escapes from the top of such furnaces a quantity of gaseous products containing in an aeriform state the whole or nearly the whole of the fuel used, and in this condition the carbon instead of existing as carbonic acid gas, which would indicate a perfect combustion of the fuel employed, is given off by a series of reactions perfectly understood by metallurgical chemists as carbonic oxide, a gas inflammable in its nature, and consequently capable of being made available as a source of further heat, as is already well known. Any attempt to introduce additional atmospheric air for the combustion of this inflammable carbonic oxide in the higher region of an iron furnace as it is worked at present would be productive of no gain, because, from the same series of reactions already alluded to as taking place, the resulting gas produced by such combustion, owing to the presence of the unconsumed carbon of the fuel in the furnace, would still be carbonic oxide instead of carbonic acid, which latter gas is produced when perfect combustion of carbon is effected. To avail myself of the heating power possessed by the carbonic oxide which hitherto has escaped from iron furnaces, I introduce into the higher part of the furnace atmospheric air by any well-known means, heated or cold, among such carbonic oxide, taking care to do so when the ironstone, limestone, or other materials used in the manufacture of iron in a blast furnace is separate from the fuel used in its reduction. By this means the inflammable carbonic oxide gas may be burnt, and its heating effects beneficially expended upon the ironstone, limestone, or other materials under treatment.

"This object may be effected by apparatus of various forms. In the accompanying engravings (preceding page), I describe one mode by which my invention may be carried into practice, at the same time I do not confine myself to any particular arrangement, so long as the object is effected of mixing air with the carbonic oxide in the higher part of an iron furnace, and in contact with ironstone, limestone, or other materials used in the manufacture of iron, and when such ironstone, limestone, or other materials are not during such admixture with the fuel employed in the smelting furnace.

"Fig. 1 represents a vertical section of a furnace so constructed from back to front, that is, from the back tuyere to the dam; fig. 2 is a vertical elevation of the same, showing the dam arch in front; fig. 3 is another vertical section of the furnace through the apertures for admitting air to consume or burn the carbonic oxide in the upper part of the furnace. . . . . Over the interior of the furnace, and from eight to sixteen feet from the top, more or less according to circumstances, a dome of sufficient strength is built, such dome being perforated with apertures indicated in the various views by the letters E and *a*. These apertures are continued through solid masonry to the top of the furnace and in the directions shown, that is, the aperture, E, occupying the central portion of the dome, is gradually expanded so as to increase its capacity, and terminates in a chimney, H; while the apertures *a, a, a, a,* are carried upwards in a slanting direction, forming four compartments surrounding the central chamber, E. In the sides of E, holes are made, and marked *b* in the different drawings, to which access is had by means of the recesses or openings, *c*, and by the gallery or platform, G, of the elevations. The compartments, *a, a, a, a,* are furnished with lids, *d*, fig. 1, worked by handles, *e*, figs. 1 and 2. In working a furnace so constructed, blast is introduced among its contents at the ordinary tuyeres near the hearth in the usual way; but, instead of charging the furnace by pouring in the fuel, ironstone, limestone, or other materials, through the throat or top opening of the furnace, the iron-producing minerals or fluxes, or both, are thrown in through the charging ports, *f*, of the chimney, H, and as the closed lids, *d*, of the other compartments, *a*, prevent the exit of the gases in that direction, they escape by passing up E among its contents; and where, by meeting streams of air, hot or cold, and introduced by any of the well-known means, ignition is produced, and the materials in E become heated and prepared for subsequent treatment in the lower portions of the furnace. Means are afforded of stirring or loosening the materials contained in E, by holes left at *g, g,* above the openings, *b, b*. The fuel is introduced by being poured in alternately through the compartments, *a, a, a, a,* the lids, *d*, being opened at the moment of such introduction, and closed immediately afterwards. The fuel thus charged, and the materials heated by the combustion of the carbonic oxide in E, continually descend from their respective compartments, and come together beneath the dome, and then continue their descent in the furnace towards the lower part or crucible thereof.

"As above stated, other arrangements or constructions of furnaces and apparatus may be used in carrying out my invention; for instance, I can introduce first a quantity of fuel into a portion of the furnace, say, E, and during such introduction, and until the fuel so added has passed the orifices, *b*, *b*, no air is there admitted. As soon, however, as the fuel has passed this point, and the charging of the other materials has commenced, air is allowed ingress so as to inflame the carbonic oxide, and this admission of air is continued until the necessary quantity of such materials otherwise than fuel has passed the openings, *b*, *b*, where the air enters. These openings, *b*, *b*, are then closed, and air excluded, while fuel is again charged, and the process alternately repeated as already described, in which case the other openings would be rendered unnecessary. This method of burning the carbonic oxide permits considerable waste of the inflammable gas, and therefore it is desirable that, whatever be the construction of furnace, the arrangements should be such that the supply both of the fuel and of the other materials should be independent of each other.

"The other precautions to be observed in working furnaces constructed as I have described, and by which the proportions of flux, fuel, and ores are regulated, I have not thought necessary to give, because the same knowledge which guides the practical smelter in adjusting the nature of his charges is equally applicable when working a furnace built upon the principles embraced in my invention."

THE SHIPS OF THE ROYAL NAVY.

The following is the official report of the discussion which took place at the Society of Arts on Mr. Reed's paper on the ships of the Royal Navy:—

DISCUSSION.

Mr. J. Macintosh, in complimenting Mr. Reed on his able paper, could not but say that the magnificent steam navy, to which allusion had been made, sailed to the Euxine and the Baltic, and, having taken up positions before Sebastopol and Cronstadt, remained there for months without doing anything in the shape of attack. The Admiralty were informed in 1853 of the number and calibre of the guns in these fortresses, which, by their concentrated fire, were sufficient to annihilate half-a-dozen British navies. The approach could only be made by a certain path, which was commanded by guns sufficient to sink 500 ships. Thus the British fleet remained out of range of the guns of the forts, their own guns being also unavailable for attack, and all they did was to keep the rats in their holes. His object had been to introduce to the authorities of the Admiralty an invention which would have enabled the English fleet to have advanced under cover of a thick vapour close up to the sea faces of the fortresses, when they could have poured in a concentrated fire that would have annihilated them. In the attack upon Sinope the Russian admiral waited for one of the Black Sea fogs which so frequently occurred, under cover of which he advanced to an attack which, though bloody in its issues, he (Mr. Macintosh) regarded as the most brilliant action of the whole war. He submitted that if his plan had been carried out during the Russian war, the lives of 50,000 brave soldiers might have been spared, and the expenditure of millions of money saved to the country. Mr. Macintosh entered into a description of his plan, which consisted in diffusing a large quantity of naphtha upon the surface of the water, either around a ship or in front of the sea face of a fortress. This body of inflammable matter was lighted by firing a prepared shell containing naphtha and potassium into it, and thus an impenetrable vapour was created, under cover of which an attack could be made with the most destructive effects.

Vice-Admiral Sir George Sartorius said, his name having been mentioned in the paper, he would offer a few observations with the view of clearing up that which would otherwise be somewhat unintelligible. When Mr. Reed communicated with him on this subject, he asked for information which was unpublished. He then presumed that Mr. Reed was fully acquainted with the correspondence that had appeared in the *Times* with reference to the steam ram; but from the statements made by Mr. Reed, it was clear that he was not fully acquainted with that correspondence. It was more than two years since the subject of steam rams was brought before the notice of the Admiralty. But the proposed adaptation of the *Great Eastern* ship to that purpose had only been recently put forth. When he proposed the plan of steam rams to the Admiralty, he was not aware that a similar suggestion had been made by Mr. Nasmyth, and he felt proud that he should have conceived an idea which was participated in by so distinguished a man. The

plan suggested itself to his mind from having noticed the results of the collisions of vessels at sea, the effect invariably being that when an iron steamer propelled at great velocity came in contact with a vessel moving at less speed, the latter sustained serious injury. As to the form best adapted for an aggressive engine of that description, not being himself an engineer or a shipbuilder, he did not consider himself competent to determine it. He, therefore, consulted with persons more particularly acquainted with the subject than himself, and, amongst others, Mr. Scott Russell. They had all told him that there was no difficulty in constructing a vessel of suitable tonnage and form with sufficient weight of iron around it, and propelled by a power that would sink any vessel with which it came in contact. He had proposed a vessel of from 3,000 to 4,000 tons, to form a shot-proof steam ram. If it was admitted that such a vessel could be constructed shot-proof, he would ask any practical sailor how it was possible for a fleet of twenty or thirty vessels to resist the effects of such an engine of destruction. The masts could be lowered, and by having a rudder at each end, the difficulty of turning the vessel, alluded to by Mr. Reed, would be obviated. He proposed to have the keel slightly curved, so that the vessel could be more rapid in changing the direction of its movements, and by the extent of steam power employed, it would have considerably higher speed than the ships of the present day. A subsequent proposition of his has been to furnish the vessel with guns, from which shot filled with molten iron could be discharged, which would fire the wooden ships against which they were projected. Another project was the suspension of percussion shells from the bow, which could be fired by the concussion of the two bodies. A vessel so armed would sink the largest ships afloat, whilst the projectiles would set them on fire. He confessed that the introduction of Armstrong's new gun had tended to alter his views upon this subject, for it was evident that a shot from that gun would go through every thickness of iron that could be reasonably used in the construction of a vessel. Under these circumstances, he maintained that ships built of timber would be useless in any future war, and if the plan of the steam ram were a favourable one, ordinary iron ships of war would be alike useless.

Mr. William Hawes said, after hearing a paper so simply yet so eloquently written as that which had been read that evening, it was rather hazardous to get up and object to one or two principles which it advocated; but there was one sentence in particular which grated harshly on his ear—it was with reference to contracts by private builders during the late war—and Mr. Reed had stated that the evils of pecuniary losses were greatly aggravated, if not altogether occasioned, by the excessive demands for wages made upon the contractors by their workmen. He thought great injustice was done in that observation to a class of men to whom this Society ought to pay the greatest respect. He believed that if the truth of the matter were known they would find that the contractors, and others filling positions above those referred to, took advantage of the war to increase their charges to a much greater extent than had been done by those in their employment. He was at all times anxious to defend workmen from such charges as these, and he thought in all statements made in public we ought not to lose sight of the position in which both masters and workmen were placed in cases of great emergency. There was one other important principle advocated, namely, that we were to sit still and wait till improvements were introduced in other countries before we adopted them. That, certainly, was not the principle which had guided us with regard to the manufactures of this country, and he should be sorry to see the time arrive when that plan would be acted upon with reference to our vessels and instruments of warfare.

General Sir Charles Shaw, as one not acquainted with naval matters, said he ought to apologize for offering any observations on the subject. He had served as commanding the marines under the gallant Admiral in the chair, as well as under Admiral Sartorius. With reference to the question, how was the propulsion of vessels to tend to our national defences? it had often occurred to him that, with the means at present in use, an entire system of military movements could be carried out with a fleet of steam ships in the same manner as with a brigade or division of an army on land. The introduction of those new instruments of warfare—the Enfield rifle and Armstrong's gun—had completely changed the system. What was the use of fortifications, when they could be attacked from a distance of five miles? They must build their arsenals inland, and by the aid of the electric telegraph an order could be executed as well at Coventry as at Portsmouth. Supposing an enemy destroyed the coast defences, they could not command more of the country than their shots could reach. Therefore, if they drew up a second line of defences out of range, no enemy could land.

Captain Norton mentioned that with the present military rifle he had pierced an iron plate ⅜ths of an inch thick at a distance of

60 yards. He had for some time anticipated that rifled ordnance of the largest size would come into use.

Mr. JAMES NASMYTH, upon being called upon by the Chairman, said that the plan of his steam ram had been so widely discussed by practical men in all quarters, that it would be imposing upon the time of the meeting to enter into any detailed description of it; but he was at any time ready to answer any distinct question that might be put to him with regard to it, in order to elucidate any points in its construction which might not have been given with sufficient clearness.

Mr. J. SCOTT RUSSELL, F.R.S., was afraid the hour was almost too late for him to take up their time with what he had wished to say, and to bring the discussion back again to the special scope and peculiar objects of the paper. All who were in the habit of meeting in that room, must feel that the paper which they had just heard was a most valuable one; and it was particularly valuable to himself, as he had been endeavouring to get together for his own use the information which that paper contained, forming the history of the progress of our navy during the present century. There were, however, one or two points in it upon which he felt it his duty to say a few words —not because they were topics peculiarly his own, but because he thought it necessary in justice to other people to do so. Mr. Reed had in his paper very carefully given to every man whose name he had mentioned his due share of blame for his mistakes, and approbation for what was right. He agreed with Mr. Reed that it was a great misfortune for England that at one time our ships were constructed — he would not say with a total want of principle—but upon maxims which were opposed to all received principles. It was the doctrine for a considerable period of time in the Admiralty, that science could do nothing whatever for shipbuilding, and that there was no greater qualification for a shipbuilder than that he should know nothing whatever of the subject. Whilst he quite agreed with all that Mr. Reed had said of Sir William Symonds and his school —if he had a school at all—he would say that they must give that officer credit for one thing—namely, that he was the means of introducing into the navy the large broad batteries which his ships first set the example of carrying, although they did not carry them well. The large batteries were still retained in the navy, and ships suited for carrying them were now scientifically constructed. Sir William Symonds was an admirable seaman; but to believe that because a man was a good sailor, therefore he was a good shipbuilder, was much the same as to say that because they had a good coachman they would set him to build their coaches. He knew Mr. Reed to be an educated naval architect, and he therefore thought that he might have dwelt a little more upon the very great merit of the more modern school of naval architecture, which he might say had overthrown Sir William Symonds, and had now taken his place. It was, perhaps, not generally known that during the official reign of Sir William Symonds, there was, struggling against every difficulty, a body of trained naval architects of very high scientific attainments. That young school of naval architects struggled through the opposition which the authorities of that time threw in their way, and determined to introduce scientific naval architecture practically into the navy. They were appointed by a more enlightened Board of Admiralty than came into power at a later period a committee of naval architects, and during the reign of Sir William Symonds, that committee (one member of which, Mr. Chatfield, he saw present)—discussed the principles on which the future fleet of England should be constructed. They produced a report, which he was afraid was not made so accessible as it ought to be. He had himself obtained a copy of that report in a circuitous way. Those gentlemen, however, produced a treatise upon naval architecture, which he had no doubt would be given to the world at some time or other, and which would do great credit to the authors. About a dozen gentlemen constituted that school of architecture. The present Surveyor of the Navy, on coming into office, adopted a very different principle from that of his predecessor. He said, "I am surveyor of the navy; but, understand, I am not a naval architect. But I will do this: I am an experienced sailor. I know what I want in a ship; and what I will do is I will associate with myself the most eminent naval architects I can get. I will tell them all that I want in a ship, then they shall inform me in what way they will give me what I want." It had been his (Mr. Scott Russell's) theory that two men were necessary to the designing of a ship —one the naval architect, and the other the man who had to fight her. That was the reason why there should always be a naval man in the construction of a ship as well as a ship-builder. It was this state of things which had raised the navy of this country to its present state of efficiency. He was one of those who were often finding fault with the Admiralty; it was, therefore, a great comfort to him to say all the good he could of them. They were going on very rapidly making great improvements, and they certainly did won-

ders in the last war. He believed they were not standing still now, but had their eyes open. Still he thought they required a little pressure from such persons as the gallant Admiral in the chair: and this paper and the discussion upon it might help them to go forward. He believed there were some men upon the Board of Admiralty who wished to go on very fast, and no doubt there were others pulling them back. If, therefore, the screw were put on, they might be induced to move forward. He thought they owed much to the present Surveyor of the Navy. It was to the Admiralty authorities that the introduction of tubular boilers was to be attributed, which formed so large an element of economy and speed in merchant vessels. It must not be forgotten, moreover, that we owed to the Admiralty the introduction of the screw propeller. It was not introduced so soon as it ought to have been, but it was introduced a great deal sooner into our ships of war than into the merchant service, and Government ought in fairness to have the credit of this. With regard to the construction of iron batteries and iron frigates and rams, he thought there were one or two persons who ought to be done justice to. The introduction of iron plates originated not with the Emperor Napoleon, but with Mr. Stevens, the great steam-boat builder of New York, who was in this country ten years ago, and who then communicated to him (Mr. Scott Russell) the results of some experiments that had been made by the States' Government with regard to iron plates. Much had been said about the great steam ram which was building in America, and which had been commenced by the same gentleman, but from all that he (Mr. Russell) had heard about it, he thought it was a very clever idea, quite clever enough to be begun, but a great deal too clever ever to be brought to a successful issue. He believed they were indebted to Mr. Lloyd, of the Admiralty, and not to Louis Napoleon, for the idea of the four-inch iron plates. The Emperor suggested the putting on of a number of thin plates to make a thick covering, but Mr. Lloyd suggested that one thick plate would answer better. He sent to the contractors to ask whether they could make these large four-inch plates. They said it was impossible, but, nevertheless, if they were ordered, they would do it, and they did it as a matter of course. He would say one word in reply to what had fallen from Mr. Hawes. He (Mr. Scott Russell) did not believe that any manufacturer or builder of ships for the Admiralty during the war put on the screw in the way of money at all. They felt that the Government was in a difficulty, and he knew that the prices at which they then built for the Admiralty were less than those at which they were now contracting for the same description of ships. With regard to himself, he would mention that the Admiralty applied to him to cast some guns in a great hurry. He replied that he could not undertake to do it because the price he must necessarily ask would be greater than he found they were paying other people; but he offered to place his foundry at their disposal during the night, without charging them any profit, but that they should appoint a person to see how much money was spent, and if they paid that he would be satisfied. Others with whom he was acquainted acted in the same way. He was happy also to say, on the part of the English workmen, that the great proportion of them acted in a similar spirit; but he was sorry to be obliged to add that some of them, when they found that those vessels of war were wanted in a hurry, asked that their wages should be raised from 7s. to 8s., 9s., 10s., 11s., 12s., and even 13s., per day; and they struck work and left the yard, because when it came to 13s. 6d. it was refused. These were exceptions. As a general rule, the workmen of England during the war came out nobly, and the few instances he had mentioned were the rare exceptions. He was always proud of the workman when he did right, and looked upon him as an equal, and was never so much ashamed, being a workman himself, as when one of that class did wrong. He would sit down with the expression of his thanks to Mr. Reed, for the very valuable matter he had brought before them that evening.

Mr. Ditchburn, in reference to the statement just made, that the present Surveyor of the Navy had called in the aid of naval architects, thought an injustice was done in that respect. In his opinion, the more suitable place for the Surveyor would be a seat at the board of Admiralty, and that a naval architect should receive the appointment of Surveyor of the Navy.

Captain Fishbourne, R.N., as a naval officer, would tender his thanks to Mr. Reed for his able paper. He would remark that as it appeared at present impracticable to manufacture iron plates strong enough to resist the passage of solid shot, their attention ought to be turned to precision of fire from the guns. This appeared to have been attained to a wonderful degree by Armstrong's rifled cannon, which, at 1,500 yards, was said to be fifty times more accurate in its fire than any other description of cannon. Assuming that to be the case, one of those guns would be equal to fifty ordinary guns at 1,500 yards. The precision of fire was so great as that they

could send the shot into the porthole every time, by which the enemy's guns might be destroyed, and the men working them killed. With regard to iron plates for covering the sides of ships, he thought there was a difficulty which could not be got over—namely, that to obtain the requisite thickness of iron to withstand shot, the displacement of the ship would be so great as materially to detract from her usefulness, the great point being to get ships that drew as little water as possible.

Mr. Reed, on rising to reply to the several speakers, took that opportunity of stating to whom he was indebted for the display of models and drawings with which his paper was illustrated. For the several models of ships, he had, he said, to thank the Secretary of the Admiralty, who had granted the use of them without hesitation. He directed especial attention to a splendid model of H.M.S. *Euryalus*—in which a royal prince had lately proceeded to sea, for the purpose of acquiring, not valour, for that was doubtless born in him, but the skill which would enable him to apply his valour wisely. For highly finished working models of a marine engine and a breech-loading cannon he had to thank Mr. Joseph Maudslay, of whose valuable improvements they were good examples. A series of coloured lithographs, representing the combined fleets during the late war, had been kindly lent by Messrs. Day and Son, of whose productions they were excellent specimens. The large drawings illustrative of Mr. Macintosh's system of warfare were furnished by the inventor. The various speakers who had noticed his paper were so kindly in their criticism, that he had but little to reply to. He felt bound to say, however, that he had scarcely done justice to Admiral Sartorius in preparing his paper, not because he was unacquainted with the letters of the gallant officer, but because the time allotted for the reading of the paper was too short to admit of elaboration. His great objection to the present introduction of such vessels as Admiral Sartorius proposed was based, however, upon the consideration that it was unnecessary, and would be impolitic for us to enter upon the realization of such plans unless other powers first resorted to them. With regard to the turning of the ram when under weigh, it would be evident that, while the use of a propeller at each end would render it unnecessary to turn the vessel completely round, it would by no means obviate the necessity of rendering her capable of changing her direction suddenly while in pursuit. But this was a matter of detail, and, as he had before said, he had not attempted to fully discuss the details of the steam-ram question. With respect to the observations of Mr. Hawes, he (Mr. Reed) accepted as his own the reply which Mr. Scott Russell had so efficiently made in so far as the contractors and workmen were concerned. As to the resistance to progress which, as Mr Hawes alleged, he had offered, it would be understood that one of the reasons why he (Mr. Reed) advocated moderation in the arts of war was that the arts of peace might thereby be promoted. In reference to Sir Charles Shaw's observations, he would simply remark that Sir Howard Douglas's "Naval Warfare," recently published, consisted principally of an able essay upon the application of military tactics to naval warfare with steam. In Captain Fishbourne's observations he discerned nothing that was not entirely in accordance with the paper he had had the honour of reading. To Mr. Scott Russell he was much indebted for the very excellent and able manner in which he had supplemented the paper, by remarks which were not only pertinent but most necessary, and which could not have been made by any other person with the same authority as the name of Mr. Scott Russell invested them with. If he (Mr. Reed) had passed lightly over the services of the members of the School of Naval Architecture, or, indeed, of any other person or persons, he must plead the enforced brevity with which he had written.

The Chairman (Admiral Sir C. Napier) said it was now his duty to propose a vote of thanks to Mr. Reed for his paper, which he must say was drawn up with great ability, and contained much valuable information. Before doing so, however, he would make a few observations upon one point of the paper especially, in order that it might not go forth to the public that we had the large available naval force there spoken of. Mr. Reed had stated that the fleet of screw steam ships consisted of fifty-one line-of-battle ships, each armed with 8-inch shell guns and 32-pounder solid shot guns, &c. Mr. Reed, in making that statement, undoubtedly meant that we had built and launched fifty-one sail of the line. He could not mean to convey that there was that force ready for service at the present day. He (the Chairman) sincerely wished there was, and then all their fears about invasion would be groundless. He believed there was not more than half that number. Of course he alluded to screw line-of-battle ships; because he regarded all sailing ships of war as so much waste timber, and the sooner we got rid of them the better. Mr. Reed had very truly said, that what was required was a well-manned Channel fleet, and with that we could set at defiance all the powers of Europe. But the difficulty

was to get such a fleet—he meant a fleet manned by really efficient seamen. A Royal Commission was now sitting with a view to find out what were the real grievances of the sailors, and what was the reason men did not more readily enter the navy. He believed that commission would very shortly make its report, and he trusted that the Government would pay attention to it, emanating as it would from able and experienced officers, and not throw it aside as had been done with the last report made to them. A good Channel fleet was what he had always contended for; and he pointed out in very few words how it could be obtained. . . . . In his opinion much of the money was now ill-spent. They were now doing what they had never done before; Government was buying land at Plymouth, Portsmouth, and other places, and making immense land fortifications, at a cost of between £300,000 and £400,000; while formerly, when we had almost the whole world against us, the wooden walls of old England were found sufficient for her defence, and this would be the case again; and he considered that the money expended upon land fortifications was thrown away, except in so far as providing a few places with guns, under which vessels could run in for shelter. Let them have an efficient fleet, man it well, and it would be found the cheapest as well as the most effective defence of the country; and no nation, whatever might be the fleet she could send out, would ever then attempt to disturb the peace and happiness of England. It was true that France was making enormous strides. She had built an immense fortress at Cherbourg, and it had doubtless been built to put a large fleet in; and that no doubt would be done some day. France had a large army; this country had next to no army: our troops were in India, and even with the militia the number of soldiers at home was very small. He therefore said it was the duty of all Englishmen to insist upon the Government keeping up a good Channel fleet of not less than ten sail of the line, and that would be the nucleus of thirty sail of the line, which could be manned in the way he had proposed to them. He had thought it his duty — inasmuch as these proceedings would go forth to the world through the press—to disabuse their minds of the notion that we had at the present time fifty-one sail of the line, which might lead them to suppose that all attempts to get more ships would be useless. He was quite sure that the vote of thanks which he now begged to propose to Mr. Reed would be unanimously accorded.

The vote of thanks having been passed, Mr. Reed acknowledged the compliment, and remarked that, inasmuch as the returns he had given of the naval force of France up to May, 1858, included vessels under building and alteration, he thought it only justice to give the same statistics with regard to our navy.

THE AMERICAN STEAM RAM.

The following description of the American steam ram, obtained by stratagem, was received from America by Mr. E. J. Reed immediately before the reading of his paper at the Society of Arts on the 15th inst., and has been forwarded by him to the secretary for publication in the Journal of the Society:—

"Stevens' Steam Battery is an iron vessel now building for harbour defence *only*, under a contract with the late Robt. L. Stevens. It is about 440 feet in length and 50 in breadth, is built apparently for speed, being very sharp forward, with clean run, greatest breadth abaft the centre of length, and with flat floor. She is now built up only to about the light load line, the 'planking' being ½-inch boiler plate double riveted to U-shaped angle iron 'timbers' about twenty inches apart; no 'ceilings' as yet; 'deck-beams' of U-shaped angle iron are in for two rather low decks, and the hold has on each side a large iron tank, extending some 200 feet amidships, and leaving but about twenty feet of space between the two tanks on the line of the keel. Each tank appears to be independent of the other, and at the forward end has an inclined engine, very heavily proportioned, which seems to be arranged for condensing air into the tank. Over the top of the tanks are large pipes of boiler plate, connecting the engine with the tank at several places, as if the tank were composed of subdivisions. No propelling apparatus is yet apparent. The plan, *as report says*, is to carry a heavy battery, of long range, as near to the water as possible, using the air tanks to secure safety from sinking if pierced by a shot below water, or from water which should wash into the low ports. The battery to be covered by a sloping roof, so that shot would glance off, and the vessel to have speed enough to be able to keep at long range.

"The original appropriation by Congress was 500,000 dollars 'toward' the construction. The executors have claimed that a little over 800,000 dollars has been expended, and that about as much more will be required to complete the vessel, though whether this is to include equipment and armament is not definitely stated. There has been much doubt expressed if the thing will ever be completed, although Mr

Stevens did contract for a specific sum, and of which he had received on account the appropriation of half-a-million dollars, as above. At present, there is only enough work doing to justify the expression that 'the work is progressing.'"

A FRENCHMAN'S OPINION OF LONDON AND ITS REQUIREMENTS.

We left Mr. Horeau—Hector, not Victor, Horeau, as we had it—about to take us around London by a continuous rail, with a station at its centre; and we were certainly not prepared to find with what facility this may be done without coming into competition with portions of railways already made, but rather to give the latter advantages scarcely to be estimated. Let us see how he would do this. With a map before us of the suburban railways in existence, we commence between Waterloo and the Vauxhall stations, and, crossing the Thames by a traffic and railway bridge (already in contemplation), we join "Punch's Railway" and the Great Western. We then start again from Vauxhall station, and join, by a new branch, the South-Eastern through Grosvenor-park close to Kennington-oval, crossing the Bricklayers' Arms station, and afterwards proceeding to Bermondsey, and crossing the Thames by his new Tower bridge (traffic and rail), join the Eastern Counties Railway. The length of line thus required to form the complete round of the metropolis would be about twenty-five miles, including the purposed Grosvenor railway and the two proposed bridges. This would probably get rid of all opposition from the present companies, and meet the requirements so loudly called for to remove the present embarrassments of street traffic.

In our former notice we omitted to allude to one of the many new streets proposed by Mr. Horeau. As this portion of his proposition is more essentially his own, we quote his words in reference thereto. "Take," says he, "a straight line from St. Paul's-churchyard near Doctors'-commons gateway, and come out at Blackfriars, bridge. All the houses in this neighbourhood are comparatively valueless, and divested of both air and sun, excepting the *Times* newspaper office." Upon this, however, Mr. Horeau would lay his hands, for he adds, "The *Times* newspaper is an institution, and, as such, should have a building and frontage in the new street worthy the age of civilization of which it is the mirror."

This, indeed, will serve as an example of what Mr. Horeau would do in many other cases. He further says, that in London the proverb exists that "time is money," and yet there is no town or city in the world where more time is consumed in the constant fret and struggle to get from place to place. Its residents have gradually got accustomed to these annoyances, but the absurdity strikes a foreigner as the most droll and contradictory phase of an Englishman's idiosyncrasies. What he would do to remedy this evil would be to "carry the houses nearer to the skies, giving width to streets, and bringing the trading community more within reach of each other." How curious this will read to those who have already enclosed the little plot of ground for money-making purposes, at the Watling-street end of St. Paul's-churchyard! What a contrast is this to what is doing in Paris, in Lyons, in Berlin, in Munich, in Hamburgh, in Brussels, and elsewhere! There nothing whatever is permitted to stand in the way of street reform. Of whatever value the buildings may be in a money sense, the great and important end is kept in view.

The subject of public fountains appears to have engaged a good deal of Mr. Horeau's attention. The water caught and purified from the rain-fall and sewers he would "acre" upon elevated places to supply these decorative and useful addenda to the metropolis. "Elsewhere," says he, "fountains are considered necessaries of town life, and, as such, every available square or corner is devoted to their being." "To show how great an element are fountains in the decoration of a city or town, I could enumerate hundreds of places throughout Europe where fountains have been raised, and are awaiting the resources of the revenue to supply the water." The dry pumps in London will here, mayhap, recur to the reader, but, if so, their full-welled brethren in chains, at the very season when the parched throat does most desire a draught, may be equally manifest to the mind's eye.

The railings which surround our parks annoy Mr. Horeau almost to uncourteous fretfulness. "Away with them!" he cries, "I cannot get from one place to another." What would he have said a few years ago, when a high wall surrounded Hyde-park, and but three or four entrances at the most permitted of the access of the pedestrian, and of none whatever to the unprivileged carriage or cab? Nor was the unlucky wight who carried but the merest parcel admitted within its precincts at that period. It is related that the sentry stopped a man with a parcel beneath his arm at one of the gates, and was rudely turning him back to make a detour of a mile and more, when a gentleman on horseback, to whom the sentry presented arms, asked the man what the parcel contained. "An overcoat," was

the reply, "for the Duke of Wellington." "Put it on then," said the gentleman, "and the brown paper in your pocket." Of course the story would not be complete unless it was added, that the gentleman on horseback was the Duke himself.

One of the principal notions Mr. Horeau appears to entertain respecting London is, that it covers too great a space, and that it is capable of being brought more together, while more ample space and advantages might be accorded to it that should amply repay such a change. It would seem that Mr. Horeau is about, shortly, to lecture upon this subject, and, when that occurs, we may return to the minutiæ of the suggestions which we have here treated.

THUYA WOOD.

The subject of trees and shrubs is one of intense interest and delight to very many people. The most illustrious names are to be found amongst its admirers. The good and graceful John Evelyn was one of the first to divest the study of its dry technical character. London, amongst modern writers, has likewise done much to give an additional charm to this branch of knowledge. The latter author, while providing ample amusement for the less money-making reader, has afforded sufficient material for the guidance of the landed gentleman who is inclined to think both of the eye and of the pockets of his successors. But these works confine themselves to the trees and shrubs of home growth. Few have yet appeared regarding colonial woods, of sufficient importance to discourage those who would give to this division of useful knowledge its due meed of attention.

Mr. Holtzapffel in his elaborate work on "Turning," gives a very minute description and classification of the various kinds of wood used in the arts. He adopts the structural distinction between *exogens* and *endogens*, thus separating all kinds of trees into two groups. Palms, bamboos, grasses, &c., are of the latter; oaks, elms, &c., are of the former. An enumeration of the several descriptions of woods *then* known follows, and includes building woods, woods for machinery, mill-work, turnery and furniture, and ornamental and dye-woods, each subdivided into classes according to their particular application.

But very many woods of great beauty and usefulness have been introduced since the date of Mr. Holtzapffel's work. It has been found that all the trees sent home from the Himalayas have, indeed, proved both hardy and extremely beautiful; but when the list of Nepal trees and shrubs, furnished by Dr. Royle for the historical part of the *Arboretum Britannicum*, is perused, it becomes a matter for lament that so few, comparatively, have reached our shores. No less than fifteen kinds of oaks are enumerated, which have never been seen alive in this country, and the engravings, &c., of these given here and there in works of travel, have been gathered together and classed under the head of "Anticipated Introductions." A writer in the *Quarterly* some years since pathetically deplored the ignorance of botany that prevails amongst our countrymen. Englishmen being found in every part of the habitable globe, were their attention once turned to the subject, England would soon become an emporium of the vegetable riches of the world, as she is already of its manufactured treasures. It is astonishing in these enlightened days to see the state of ignorance in which we are respecting the woods used for ornamental furniture. We do not know from what tree either the satin-wood or the partridge-wood of commerce is produced. (Holtzapffel gives the latter to a description of palm.) The rose-wood is a native of Brazil, and is said by some to be a kind of convolvulus; the ebony is a native of Madagascar and Ceylon; and the trees from which king-wood, tulip-wood, and several other kinds of ornamental wood are obtained are known to us only by sample. If every English traveller, whether a botanist or not, would send home all the seeds he could procure, though he might occasionally furnish only worthless or common plants (as Bruce sent the common mustard-seed from Abyssinia), yet he could not fail ultimately to confer a vast benefit on his country.

These facts have been suggested by the inspection of several very beautiful cabinets, caskets, dressing-cases, ink-stands, and other ornaments for the writing table, principally formed of a wood from Algeria. This wood appears to combine all the best qualities, both of colour and grain, of the choicest and most expensive kinds. The apparent hardness of the polish of the surface is as that of agate. The eccentricity of its markings partakes of the knots occasioned by the junction of the branches with the stem, and of the curls produced by the confused filling in of the space between the forks or springings of the branches, as in the yew. With this is intermixed a gnarled appearance, such as arises in certain polished roots of trees, induced by the junction of the rootlets, or arms of the root, with the body of the root itself, as in walnut wood. Then there is a crowding together of little germs, circling and eddying under the eye like a fairy cauldron at work. A delicate ripple mark and serpentine effect washes through all this, and interlaces the larger and grander characteristics. In some speci-

mens, again, there are isolated spots of microscopic detail as if arising from a peculiar compression of the grain; and with these attractions there is, moreover, a semi-transparent effect produced, as if the eye penetrated somewhat below the surface of the wood, and could, by a yet more earnest gaze, bring to its vision an ever-recurring succession of kaleidoscopic beauties. The size of the tree which produces the wood (Thuya, not Thraya, as some of our contemporaries erroneously have it) cannot be very large, as the pieces in solid or veneer for the most part do not exceed a foot and a-half or two feet square. The supply to this country from the French authorities has been secured by Messrs. T. A. Simpson and Co., the eminent jewellers of Regent-street, who have certainly introduced the Algerian stranger in a garb which fully justifies its use in the palaces of the great and the homes of the wealthy. The honour that has been accorded to it in France is great indeed. The private boudoir of the Empress has been entirely lined with it, and the *tout ensemble*, we are told, is a grandeur and lightness of effect which the depth and richness of the colour of the Thuya imparts, almost unaided by extraneous embellishment. Here, then, is one beautiful wood amongst many stretching out its branches to the traveller, and destined to employ and reward the skilled cabinet-maker, the art manufacturer, the retailer, and the merchant, and to be gazed upon with admiration for centuries in mansions and palaces.

THE ABUSE OF PREMIUMS IN THE MECHANICAL DEPARTMENTS OF AGRICULTURAL SHOWS.

We are amongst those who are disposed to give every credit to the practical workings of the several agricultural societies which characterise the present period of our national progress, and it is too much to expect that these bodies should be altogether free from the imperfections which are more or less inherent in all things mundane. When, however, we find that a system which is admitted to work ill is persevered in because it happens to be part of the original plan of operations, and its continuance is alone persisted in upon the obstinate and feminine logic of "because it is," it is high time to point to the malady ere it becomes too strong for the constitution of the corporate body. In some, it may be in all, the agricultural "codes" prizes are awarded to exhibitors, irrespective of ownership, title, patentship, or participation in the thing exhibited. Now let us see how such a regulation works. Gabjaw has got the gift of eloquence, and can talk loud and long to a small or large audience, and descant in selected and appropriate terms upon any article which, *as an agent*, he may be entrusted with for exhibition at any one of the agricultural shows. If the article be really worthy of distinction, it fairly gets the envied recognition, and, mayhap, the more solid pudding in the shape of money or medal. But to whom does this premium go? To the man whose inventive gifts have consummated the concentration of mechanical talent? To the manufacturer who has brought capital and art to bear upon its completion? Any rational being would answer, "Certainly, to the first, the first honour belongs; to the second, the second is due." But he, the rational, would be in error, for neither of these men have anything whatever to do with it. They are ignored, and are placed, in the race for prizes, "nowhere." It is the "exhibitor." The man who enters your works, perhaps, but yesterday for the first time, is entrusted with a sample specimen of your invention or discovery; and of whom, after he has returned it, you may not care to know, or at least may never see again,—in fact, the porter, the showman, the three-days' tenant of a stand at Chester, at Salisbury, at the Cattle Show, or elsewhere.

Admitting that "the labourer is worthy of his hire," and that, as an "exhibitor" (if the agent can be recognised as *the* exhibitor), is entitled to some reward, surely, in justice, it was never contemplated to give to a hired agent a gold medal or premium which permits of his using these honours in a manner most injurious to his employer, and inimical to the welfare of the object that induced the award! Two or more instances of this state of things made themselves manifest, and annoyed the sense of right, at the recent Cattle Show,—"*No connection with the opposite stall.*" "*The only invention of the kind.*" "*Beware of gross and fraudulent imitations.*" "*Caution.*" "*Legal proceedings will be taken,*" &c. That this contemptible system of touting is mainly traceable to the method in which the medals and other rewards have been distributed, there can exist but little doubt, and, as the evil must necessarily increase as the cause of it is extended, we must be prepared to find our agricultural shows in a few years representing all the jealousies and bickerings which once marked the manners of the second-hand clothiers of Monmouth-street, instead of an arena where the judgment and discretion of a wise Council should find unconflicting expression at least sufficient to regulate the immediate patronage of the visitor in his choice of the best and most deserving article of the description he may be in need of.

INSTITUTION OF CIVIL ENGINEERS,

December 14, 1858.

ANNUAL GENERAL MEETING.

THE Report of the Council for the past Session was read, and commenced by regretting that there had not been a general resumption of works of public utility and of private enterprise in the United Kingdom; a large proportion of the professional engagements being still in foreign countries, or in the British colonies.

The statement of the receipts and expenditure showed an increase of receipts and a diminished expenditure, and that there was a balance of upwards of £1,000 in the hands of the Treasurer. The financial position was in every respect so satisfactory, that the Council intended to apply a portion of the surplus funds to the improvement and extension of the library.

The Report concluded by congratulating the members on the general satisfactory state of the Institution, which to some few, still among them, had been, from its humble beginning in 1818, an object of solicitude. Ample funds, volumes of proceedings printed rapidly, well-attended meetings and crowded *conversazioni*, were the outward signs of prosperity, but they also indicated the greater necessity for increased exertions on the part of all who would insure the permanent prosperity of an Institution which had done so much good, and might still continue to be so useful, if it was adequately supported by the members of a profession which took no mean part in the labours of the present century.

After the reading of the Report, Telford Medals were presented to Messrs. J. A. Longridge, G. Robertson, J. Henderson, R. J. Hood, Major-Gen. G. B. Tremenheere, and A. Giles; Watt Medals to Messrs. G. L. Molesworth and T. S. Sawyer; Council Premiums of books to Messrs. C. H. Brooks, F. C. Webb, S. A. Varley, R. C. Despard, A. Wright, and J. Brunlees; and the Manby Premium in books to Mr. L. Molesworth.

The thanks of the Institution were unanimously voted to the President for his attention to the duties of his office; to the Vice-Presidents and other Members and Associates of Council, for their co-operation with the President, and constant attendance at the meetings; to Mr. C. Manby, Secretary, and to Mr. Forrest, Assistant-Secretary, for the manner in which they had performed the duties of their offices; as also to the Auditors of the Accounts and the Scrutineers of the Ballot, for their services.

The following gentlemen were elected to fill the several offices on the Council for the ensuing year:—Joseph Locke, M.P., President; G. P. Bidder, I. K. Brunel, J. Hawkshaw, and J. R. McClean, Vice-Presidents; W. G. Armstrong, J. Cubitt, J. E. Errington, J. Fowler, C. H. Gregory, T. E. Harrison, T. Hawksley, G. W. Hemans, J. S. Russell, and J. Whitworth, Members; and J. A. Ransome and A. Slate, Associates.

INSTITUTION OF CIVIL ENGINEERS OF IRELAND.

AN ordinary general meeting of this Institution was held on the 14th inst. at Dublin, Mr. M. B. Mullins, president, in the chair. The paper read was on "Beams and Girder Bridges," by William Anderson, Associate, being in continuation of former communications on the same subject. Having in them shown the manner in which the strains in the several parts of uniformly loaded beams were determined, he now concluded the theoretical part of his subject by considering the effect of passing loads. The analytical investigations were illustrated by numerous coloured diagrams, and many of the propositions were proved by means of an accurately constructed model of a lattice beam, the property of Trinity College, Dublin, and lent for the occasion by the engineering profession. The several bars composing it being replaceable at will by spring balances, the theoretical deductions received the most direct proof of experiment.

The paper concluded with a recapitulation of the conclusions which had been established.

THE NEW ADELPHI THEATRE.

ALL who recollect the old Adelphi theatre must admit that a worse-constructed arena could not exist. All who will see the new Adelphi theatre will equally agree that a more beautiful model than its interior now presents is scarcely to be met with. As a means to an end it is perfect. Not a nook, not a seat is there throughout the entire edifice but gives to its occupier a free and uninterrupted view of the stage. It is lightness and elegance combined, and its domed ceiling has more the appearance of being blown into form than raised by the ordinary means. Mr. Webster deserves every credit for the liberality which has thus resulted in so much that is charming, and, through entrusting its construction to Mr. T. Wyatt, he has the proud satisfaction of seeing a Thespian temple in every respect worthy the present claims of the art of decorative architecture to a high position

in a civilized age. Nor will the public find themselves less fortunate in the fact that the glorious and glowing pencil of Mr. Sang has been called in to give the "optical gamut of colour" to the chastened proprieties of the designer. The ceiling is peculiar in an architectural point of view, and will elicit a good deal of admiration from those who are most conversant with the difficulties of treating such portions of theatrical interiors. The modelling of the spandrels, &c., is no less remarkable, and the happy thought which introduced into its centre a perspective circular balustrade looking through and into a tranquil Italian sky, must elicit praise from the lovers of novel and ingenious construction.

THE IRON TRADE.

(From our Correspondent in Wolverhampton.)

Its Reviviscence—How traceable—Universality of the Revival—Evidences—Profitable Mode of Investment—The Bankrupt Estates—Preliminary Meeting of the Trade—Prices—Aspects of the Markets of America and France—Board of Trade Returns—Great Progress of the Trade.

To the Iron Trade the past month has been a time of steady progress. Taken in connection with the state of the general trade of the country, the fact has shown that to say that the iron trade is exhibiting an increase of life is to say also that the trade and commerce of the nation are becoming more healthy. There is now so close a connection between trade and machinery, and the use of iron in other directions, that the prosperity or depression of one is equally the depression or prosperity of the other. The Board of Trade Returns for November this year, and in particular those for December, will show most favourably, in comparison with those of the corresponding months in 1857. As to no trade was the late crisis more depressing than to that of the manufacture of iron, so to neither one is the steady return of capital to its most profitable exercise—that of commercial exchanges, more cheering. On every hand throughout the whole of the ironmaking districts of the three kingdoms the same effects are observed.

In the Scotch, the Cleveland, the Newcastle, the Yorkshire, the Derbyshire, South and North Staffordshire, and the North and South Wales districts, the blast furnaces that for some time have stood black gaunt spectres, scaring every timid capitalist from investing his money in "iron shares," are gradually changing into beacons that give cheering indications that around them gold is being multiplied, and the industrious are being fed.

The experience of good business men who have been put in charge of the operations of blast furnaces in South Staffordshire for the purpose of working them on creditors' behalf, has shown that under very unfavourable circumstances they are a profitable mode of the investment of money; and most of the estates that are being so worked are producing larger dividends than were at first expected from them; and this notwithstanding that by the joint pig and malleable iron works J. W. Riley and Sons lost £10,000 (Wolverhampton) for a few years prior to the late crisis. The three Millfield furnaces of this firm have, however, just been purchased for £12,500, and are being rapidly prepared for reignition by a firm who will make them a most valuable property.

The preliminary meeting of the trade will be held on the 30th of this month (December), when pigs are expected to fetch more money than last quarter, but the prices of malleable iron will be maintained at the level which they have ostensibly kept all the quarter.

From the Board of Trade Returns for October we extract the following particulars respecting the exports of iron and machinery in that month and the corresponding one of 1857:—

	Oct., 1857.	Oct., 1858.
Pig iron	£155,165	£85,715
Bar and rod iron	485,803	422,453
Iron wire	44,377	19,942
Cast iron	65,271	48,393
Wrought iron	376,572	270,962
Steel	63,463	72,299
Machinery, steam engines	114,319	111,830
„ other sorts	297,885	322,555

Respecting the ten months of this year, as compared with the ten corresponding months of last year, it may be remarked that this year exhibits a decrease in the exportation of machinery, except steam engines; but the reverse was the case in October, the exportation of steam engines having fallen off, chiefly in the direction of India and Australia, whilst other sorts were shipped to a greater extent than previously. Russia, France, and India were the countries to which this increased exportation took place. The iron trade of the month was dull; the only branch which does not show a decrease being steel. Taking the longer period, there is a fair increase in cast iron, chiefly in the exports to Egypt, India, Australia, and the United States. Pig and bar iron and iron wire show a difference on the wrong side of nearly one-half. The annexed table shows the total exports during the ten

months ended October 31st, compared with the first ten months of last year :—

	Ten months ended Oct. 31st, 1858.	
	1857.	1858.
Pig iron	£1,445,658	£,906,918
Bar and rod iron	5,535,619	4,512,853
Iron wire	198,583	176,216
Cast iron	642,909	722,221
Wrought iron	3,446,827	2,838,518
Steel	618,204	489,740
Machinery, steam engines	905,331	991,892
" other kinds	2,417,780	2,165,127

GUNPOWDER ACTING AS A PERCUSSION POWDER.

To the Editors of the Mechanics' Magazine.

Gentlemen,—Some years ago, when I found, by experiments, that gunpowder would explode on an anvil when struck by a heavy hammer, as recorded in your Magazine, No. 1840, I proposed to the Ordnance authorities to make the experiment with an elongated shell discharged from a rifled cannon, but they refused to do so. The rifled shell that I submit fully explains the *modus operandi.*

I am, Gentlemen, yours, &c.,

J. Norton.

Rosherville, Dec. 13.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

Talbot, W. H. F. *Improvements in the art of engraving.* Dated Apr. 21, 1858. (No. 875.)

See *Mechanics' Magazine,* No. 1840, p. 468, for Nov. 13, 1858.

Horsey, J. *Improvements in india-rubber and other pouches, and in elastic band or ring fastenings for pouches.* Dated Apr. 21, 1858. (No. 876.)

This consists, 1. In manufacturing pouches with an india-rubber or elastic cover, which being turned over that part of the pouch containing the tobacco, protects the same and prevents it getting out at the edges. 2. In forming, on elastic rings or bands, one or more bands or tabs. A button hole or slot is formed in the tab which connects it to the article by a button, stud, binding screw, spring ring, or other means.

Green, E., and E. Green, jun. *Improvements in apparatuses for generating and superheating steam, and for heating.* Dated Apr. 21, 1858. (No. 877.)

This refers to three previous patents of E. Green, dated 10th Dec., 1845, 10th Dec., 1853, and 13th Sept., 1856. In the flues through which the heat from the furnace escapes, the patentees place a series of pipes, resembling those described in the specifications of the patents mentioned above. Within these pipes they place either blocks of metal, earthenware, &c., or hollow pipes, which may be filled with water, leaving a space for the passage of water between the outer and inner pipes. The steam from a boiler which is to be used in the cylinder of a steam engine is in the latter arrangement caused to pass through the external pipes and around the inner pipes. The object of placing the blocks within the outer pipes is to cause the particles of water which pass through the latter to impinge upon and pass rapidly through the heated outer pipes, whereby it becomes heated. To facilitate the heating of the water, and the liberation of steam as it is generated, the internal blocks may be put in motion, either rotary or other, by bevel wheels, &c., and be so formed as to agitate the water when thus put in motion. There are modifications included.

Parker, B. *Improvements in the permanent way of railways.* Dated Apr. 21, 1858. (No. 879.)

This consists in forming hollow cast-iron sleepers of a parallelogram or other form in plan, with downward bevelled flanges at the sides and ends, the surfaces being bored with holes to reduce the weight thereof and enable the ballast packing to be rammed up. On the upper surface of the sleeper is formed a recess containing an elastic packing bed piece or spring. The chair is formed with a flat bottom for resting upon an elastic bed piece, the bearing being increased longitudinally. For fastening the chair upon the sleeper, and for securing the width of gauge, the patentee casts cored wings or sockets upon the sleepers, and dove-tail wing pieces upon the chairs, and by punching a dove-tail hole in each end of a plain bar of iron forms a suitable tye rod which is placed within the socket or projection cast in the sleeper, the dove-tail or other projections of the chair coming within those provided in the sleeper. He prefers to use a wedge or key to hold the same down.

Bishop, W. *Improvements in machinery or apparatus for ticketing or labelling spools, bobbins, or reels, for adjusting the size thereof, for sampling patterns, for printing labels or tickets, affixing postage or other stamps or labels, for cutting their edges, and dividing them into given quantities and sizes.* Dated Apr. 22, 1858. (No. 880.)

This relates to a former patent, dated 14th July, 1854, and cannot be described without engravings.

Clegg, S. *Improvements in gas meters.* Dated Apr. 22, 1858. (No. 882.)

The interior of this meter consists of a series of excentric chambers (by preference four) which in rotating are filled and emptied in succession. The excentric measuring chambers rotate in a vessel which contains water, and the rotating parts of the meter are buoyed up by a central air vessel, by which the pressure and friction on the axes are reduced.

Chatterton, J. *Improvements in combining and coating insulated metal conductors for electric telegraphs.* Dated Apr. 22, 1858. (No. 883.)

When combining two or more insulated wires, they are laid together by ordinary laying machinery, and, as they pass from the laying machine, they enter a vessel containing a composition of insulating materials kept heated, by which the combined product from the laying machinery is coated, and then the same is caused to pass through an ordinary covering apparatus, by which a coating of gutta percha, &c., is applied, the several processes above mentioned being performed simultaneously.

Gilmour, G. *A telegraph cable or rope shackle.* Dated Apr. 22, 1858. (No. 884.)

This invention cannot be described without engravings.

Smith, G. *Improvements in the manufacture of zinc.* (A communication.) Dated Apr. 22, 1858. (No. 885.)

This consists in the introduction of retorts for the distillation of zinc into the space intervening between reverberatory or air furnaces and their stacks, whereby the waste heat is utilized for the distillation of zinc.

Maugey, P. *Improvements in diaphragms for optical instruments.* (A communication.) Dated Apr. 22, 1858. (No. 887.)

This consists in making the diaphragm of a disc or sheet of india rubber. A small circular opening is made on this disc, the edges of which are securely held or clamped, and by forcing the disc outwards, so as to stretch the material, the central opening will be expanded, and *vice versâ.*

Sanghee, H. A. de. *A composition proper to prevent the incrustation of steam boilers.* Dated Apr. 22, 1858. (No. 888.)

This consists of two compounds. The first is

formed of wood ashes, two-twentieths; powdered charcoal, two-twentieths; resin or pitch, six twentieths; and stearine, ten-twentieths. The second of soft soap, six-twentieths; tallow, twelve-twentieths; and the remaining two-twentieths of three-fourths of powdered charcoal, and one-fourth of soot or lamp black. The ingredients are amalgamated, and formed into balls or cakes.

BECK, W. *Improved machinery for weaving fringes and other fabrics.* (A communication.) Dated Apr. 22, 1858. (No. 889.)

The chief object here is to effect the weaving of all kinds of fringe having a skirt, without the necessity of interweaving the weft threads along that edge of the fabric which requires to be cut, and the invention consists in combining with a loom for weaving fringe a bar or rod connected at one end with the breast beam, and passing through the lay; and causing the shuttle when moving in one direction to carry the weft thread over the rod, and on the return motion to carry it under the rod, thereby causing the weft thread to pass around the rod, so that during the operation the weft threads shall be held by the rod as by a salvage along one edge of the fabric, and along the other edge by the web formed by the interweaving with the warps. It also consists in cutting the threads forming the skirt fringe on the rod by combining spears with the rod, by which the skirt fringe will be cut against the edge of the rod, as the fabric is moved along during the weaving.

AIMONT, P. E. *Improvements in railway indicating and signalling apparatuses.* Dated Apr. 22, 1858. (No. 890.)

This invention was described at page 491, No. 1841.

PADDON, J. B. *An improvement in gas regulators.* Dated Apr. 22, 1858. (No. 892.)

This invention was described and illustrated at page 461, No. 1840.

DONKIN, T. *Improvements in apparatus employed in the manufacture of paper, applicable also to controlling the motion of travelling webs and fabrics.* (A communication.) Dated Apr. 22, 1858. (No. 894.)

In the manufacture of paper the endless wire upon which the pulp is supported and carried through the machine passes over a guide roller, which, when the wire moves either to the one side or the other of its proper path, has its position changed by a screw acting upon its shaft or axle for restoring the wire to its true direction, and the said screw has heretofore been moved by hand. The object of this invention is to connect with the screw certain apparatus by which the parts may be made self-acting, and it consists in placing upon each side of the wire at a short distance from the guide roller a vertical guide connected to a horizontal traverse spindle or lever, which carries at its end a fork embracing a belt driven by any suitable running shaft. This belt passes round one of three pulleys placed side by side upon a shaft or shafts, the middle one being a loose pulley, the other two working shafts, which are connected with the axle of the screw before mentioned, so that, when the vertical guides are moved by the wire (as it leaves its path) either to the one side or to the other, the belt shall be moved from the loose to one of the other pulleys, whereby the screw shall be so caused to act upon the guide roller as that it shall restore the wire to its path.

GREENSHIELDS, T. *Improvements in purifying gas produced from coal, and obtaining ammoniacal and other alkaline salts.* Dated Apr. 23, 1858. (No. 895.)

One part of this invention has for its object to separate and remove from the gas the ammonia, sulphur, and carbonic acid. The patentee makes solutions containing elements that would decompose or separate the impurities and combine with ammonia, sulphur, and carbonic acid, and form new combinations with one or more of the elements contained in the solutions, and when combined that would be soluble and not volatile, but become fixed. By using an apparatus known in gas works as scrubbers, the ammonia, sulphur, and carbonic acid would be separated and removed from the gas. Another object is that the solutions should be used so as to obtain the new combinations in a form best adapted for being manufactured into marketable articles. Another part refers to a process or processes for manufacturing from the products obtained from the purification of gas, muriate of ammonia, carbonate of soda, and other products.

ATKINSON, C. *A certain improvement in Venetian blinds.* Dated Apr. 23, 1858. (No. 897.)

This consists in the use of thin plates or laths of steel, as a substitute for the laths of wood.

SILLEM, H. J. *Improvements in the machinery for the manufacture of sugar.* Dated Apr. 23, 1858. (No. 898.)

This consists of an apparatus formed of scrapers, plates, and brushes, which may be brought into proximity with the centrifugal machine, so that their distance from the inner perforated surface of the revolving drum may be regulated at pleasure for equally distributing the charge at its introduction into the machine, and also for removing the charge from the rotating surface after it has been converted into "cured" sugar without the necessity of stopping the machine.

PIRSSON, J. P. *Improvements in the condensers of steam engines.* Dated Apr. 23, 1858. (No. 899.)

This invention was described and illustrated at page 457, No. 1840.

FOSTER, W. *Improvements in multitubular and other boilers for the prevention of smoke and economising fuel.* Dated Apr. 23, 1858. (No. 900.)

Here, a fire-brick bridge is built immediately behind the fire-bars, which bridge is carried up higher than usual so as to confine the flames blown over by a fan. A few inches behind this bridge is built a second bridge of the same height as the first, and behind this second bridge are a number of fire-brick partitions disposed either longitudinally or transversely in the fire-box, and extending when placed longitudinally from the bottom to the top of the fire-box or flue, intermediate spaces being left between them for the passage of the flame and unconsumed gases, which will be ignited and burnt by the heat of the partitions. The air is supplied to the furnace by fan blowers, the conducting pipes from which enter immediately beneath the fire-bars, the ash pits being entirely closed in.

JENKIN, A. *Improvements in furnaces for the reduction and calcination of lead, tin, and copper ores.* Dated Apr. 23, 1858. (No. 901.)

This relates to a former patent, dated 23rd April, 1855, and cannot be described without engravings.

YORK, J. O. *Improvements in obtaining power when bi-sulphuret of carbon is used.* (A communication.) Dated Apr. 23, 1858. (No. 902.)

These consist in employing the vapour of bisulphuret of carbon as motive power without mixing it with steam, and in condensing the vapour, and again and again using the material.

LUNGLEY, C. *Improvements in the construction of portable ships and boats, and their appurtenances.* Dated Apr. 23, 1858. (No. 903.)

This relates, 1. To constructing metal ships and boats which can be taken to pieces and stowed away. The patentee proposes to provide both ends of the vessel with steering apparatus. When fitting vessels with a screw propeller he prefers a peculiar construction of double rudder. The screw is to be fitted so that its height may be adjusted at pleasure. In some cases he proposes to fit a rudder to each end of the vessel. To permit of these boats being used as land carriages, he builds up in them tanks, in which are mounted wheels capable of being raised or depressed by regulating screws, their bearings sliding in vertical guides, and being provided with springs to ease the draft. The anchors to be used with these boats are made of a plate of iron shaped to a rounded or arched form. At the opposite ends of

the plate other plates are secured by bolts and nuts to form the flukes. The shank is secured to the crown by a bolt, and to distribute the strain he connects the crown at both ends with the shank or the shackle by tension chain rods.

Stocker, A. S. *Improvements appertaining to articles to be affixed to boots and shoes, and to the feet of animals, and in the machinery and means employed for pr'ucing the same.* Dated Apr. 24, 1858. (No. 904.)

Here the patentee takes a sheet of leather, gutta percha, &c., and places it between a pair of cutting tools fixed in a fly press, which tools will cut up the sheet of material into certain size soles, which are then passed on to another apparatus, into which are placed another pair of tools to operate upon the soles, and produce therein round holes into which metal plugs are placed. He places the ends of the plugs so that, when affixed to the boot or shoe, they shall come in contact with the ground, and the head of the plug shall be within the sole. The invention consists also in producing articles to be affixed to boots and shoes when made entirely of metal, some of which are known as York grooved heels, grooved solid back or bitted heels, flat or Scotch heels and toes, to all of which the invention applies. This part of the invention cannot be described without engravings.

Maitre, J. *Proper apparatus for washing iron mineral.* Dated Apr. 24, 1858. (No. 905.)

Here the patentee subjects to the action of the stampers only the ore which requires crushing, and not the finer ore, which is too tender. The workman throws the ore on a cast-iron plate placed before a grating, and another workman, adding the water, causes the ore to move on, the fine ore passing through the grating, and the rougher passing under the stampers or rollers, whence, after being crushed, it goes out at the same time with the fine ore, which, having passed through the grating, is drawn on each side of the stampers.

Bodmer, R. *An improved apparatus for removing sand and similar loose material from docks, rivers, and waterways.* (A communication.) Dated Apr. 24, 1858. (No. 907.)

This consists in carrying a pipe down to the sand, &c., and causing a partial vacuum in such pipe by a pump, so that the sand, &c., is drawn up the pipe and received into vessels for removal.

Lillywhite, F., and J. Wisden. *An improved apparatus for projecting cricket balls, or other similar articles.* Dated Apr. 24, 1858. (No. 908.)

The object of this apparatus is to use a "catapulta" in the game of cricket as a medium for correct bowling, enabling players to practise batting where no efficient bowling is to be obtained. The apparatus performs every phase of bowling as the operator may direct, the ball rising or falling, or being projected direct at the wicket, as if delivered from the hand.

Clark, W. A. *Improvements in expansive bits.* Dated Apr. 24, 1858. (No. 909.)

This consists, 1. In a mode of constructing the moveable cutter and the recess in which it is secured, by which the edge of this cutter is relieved from pressure, and secured from vibration in the stock. 2. In the combination of a moveable cutter, bevelled as described, with a bevelled plate or follower for securing it in place, the said plate being drawn up by a screw, &c. 3. In so arranging the moveable and stationary cutters in relation to each other that the stationary cutter shall deliver its chips in front of the moveable cutter, the parts being so arranged that all the chips made by the instrument shall be delivered upon one and the same side of the shank of the bit, thereby allowing the other side of the shank to be left entire to support the working parts, any recess on the back side of the shank to allow the chips to pass being, by this device, rendered unnecessary.

Horton, J. *An improved construction of horse-hoe.* Dated Apr. 24, 1858. (No. 910.)

The patentee combines in the same implement rotating knives with stationary knives, so that they will both be completely under the command of the attendant when the hoe is in use, and may one or both of them be easily thrown out of action. A row of turnips may, by these means, be thinned and hoed simultaneously on both sides.

Fisher, J. M. *Improvements in chimney tops or cowls.* Dated April 26, 1858. (No. 914.)

This consists in constructing chimney tops in two principal parts, one fixed upon the chimney and the other free to revolve over the fixed part. The fixed part terminates at top in rows of deflecting plates. The moveable part is in the form of a lobster back placed inside a cylindrical case; the lower part of the lobster back has deflecting plates, opening into the outer case, for stopping the down draft, and directing it upwards. This moveable part is supported upon a spindle roundwhich it is free to turn, the spindle entering into the long socket, upon the top of which is the vane.

Braidwood, J. *Improvements in steam boilers and furnaces.* Dated Apr. 26, 1858. (No. 915.)

The arrangement of apparatus here employed may be modified in various ways, but the essential feature of the first part of the invention is the production of a current through the boiler and a separate vessel, and the contriving that this current shall be slower at one part of its passage through the separate vessel, so as to deposit the matters suspended in it. The improvements in furnaces consist in arranging the fire bars so as to be inclined at an angle of 45° in plan to the horizontal centre line of the furnace. The intention of this is that the air rising up between the bars shall flow obliquely across them towards the inner end of the furnace, for preventing the accumulation of clinkers on the bars. He also prefers to make the inner end of the grate higher than the outer end, so that the green smoke from the fresh fuel near the mouth of the furnace may be compelled to flow closely over the incandescent fuel at the inner end.

Westerby, J. *Improved apparatus for lubricating pistons.* Dated Apr. 26, 1858. (No. 916.)

On each side of the cylinder is an air vessel (say of glass) to contain the oil, in the interior of which is a syphon pipe connected by a bent pipe with a tap with the cylinder about midway of the stroke of the piston, which pipe is furnished with a check valve opening only towards the cylinder. The oil is placed in the vessels, and passes through the syphons down the bent pipe into the cylinder, the quantity being regulated by the taps. When the pressure of the steam, &c., is full on, the syphons and pipes present a column of resistance fully equal to the force. When the steam is off and the piston down, or when the piston is above the entrance of the oil or grease into the cylinder, the supply is self-acting and meets all demands.

Jones, W. *An improved machinery for ringing bells.* Dated Apr. 26, 1858. (No. 917.)

Here the bells are hung in a suitable framing, and each provided with a cranked lever terminating in a weight forming the striking hammer. The hammers are in connection with corresponding levers, by means of cords, chains, or wires passing over pulleys, the weight of the hammers being counter-balanced by springs to retain the levers in a horizontal position. The apparatus for actuating these levers and lifting the hammers consists in an arrangement of pinion gearing which gives motion to rollers mounted in a rotating frame, and upon which certain tappets are arranged to act upon the levers. This revolving frame is governed by a ratchet and ratchet wheel or division wheel and catch, so that any tappet shaft mounted therein may be brought into gear with the levers, according to the "service peal," change, or combination of bells required. The driving toothed wheel may be actuated by a winch handle or otherwise.

Seaman, J. *Improvements in machinery or apparatus for effecting the working or cultivating of land, and in the means of driving the same.* Dated Apr. 26, 1858. (No. 920.)

This invention was described and illustrated at p. 529, of No. 1843, for Dec. 4, 1858.

Foster, W. *An improved vent-tap.* Dated Apr. 26, 1858. (No. 921.)

This relates to taps used for drawing off fluids from closed vessels, and consists in introducing an air way or vent, so constructed that the plug that allows or cuts off the flow of the liquor, also opens or cuts off the passage of air through the tap to the vessel; but as this is not at all times requsite, the patentee so constructs the taps that the air way shall be brought under the control of the user at the time the fluid is being drawn off; this may be done by the main plug, or by a stop acted on by a spring, or by a screw, or by an additional ground plug.

Lee, E. E. *Certain improved modes of applying vitritiable materials for the ornamentation of metal buttons, clasps, and other articles of dress, and which said improvements are also applicable to the ornamenting of gilt-jewellery, book-clasps, and mounts; also parts of lamp-stands, chandeliers, and other such like articles made in dies, moulded, or formed in any other way.* Dated Apr. 26, 1858. (No. 922.)

This consists of a mode of applying such materials whereby the patentee obtains, he says, all the effects of enamel work without its general opacity, having almost as brilliant an effect as would be obtained if gems or precious stones had been set in the articles ornamented.

Hunt, E., and H. D. Pochin. *Improvements in the treatment and application of resins and resinous substances.* Dated Apr. 27, 1858. (No. 925.)

In each of the apparatuses employed there is a still, which receives the substances to be purified, and receivers communicating by pipes with the still. A steam pipe from a boiler reaches to the bottom of the still, where it radiates into smaller pipes perforated to allow of the exit of steam. For the details of the process, the specification must be consulted.

White, E. *Improvements in facilitating reference by means of indexes.* Dated Apr. 27, 1858. (No. 926.)

This novelty here consists in the use of the margins at the top and bottom of the book, together or separately, in conjunction with that at the front, or fore-edge thereof; in a peculiar combination of letters and numbers by which the results are obtained; and in the extent to which such combinations may be carried out. The alphabet is made the starting point, and a separate index is formed to each of all the letters that can be used in conjunction therewith, and second thereto, and so on with each letter in succession.

Vasserot, C. F. *Improvements in the arrangement and construction of blast-engines, pneumatic machines, and pumping engines generally.* (A communication.) Dated Apr. 27, 1858. (No. 928.)

The improved machine is composed of three cylinders, one within another, leaving a space between for water, mercury, or other liquid. The intermediate cylinder is insulated and plays in this space, passing through the liquids and is covered at the top. A tube, with a valve at its mouth, passes through the centre of the inner cylinder, and communicates either with the external atmosphere, or with a reservoir of water or air regulator, according as the machine is to be used for a pump, a pneumatic machine, or blowing engine. Other parts are of course included.

Fraser, J. *Improvements in the manufacture of nitrate of potass.* Dated Apr. 27, 1858. (No. 929.)

The patentee takes muriate of potass and nitric acid, dissolves the muriate of potass in water, and allows it to subside. This liquor is placed in a vessel, the nitric acid added, heat applied, and the muriatic acid is collected and condensed into acid in the usual way. The residue is put in vessels to caystalize, and the crystals are found to be nitrate of potass, which may commercially be called pure. He also produces a nitrate of potass from the ordinary nitrate of potass produced in the East Indies by dissolving it in water and adding nitric acid, then boiling and crystallizing in the usual way.

Sautter, M. *A new and useful improvement in diving bells.* (A communication.) Dated Apr. 27, 1858. (No. 935.)

A tube is connected to the upper part of the bell, to allow the passage of a man, and in this tube there are two transverse air-tight partitions, constructed, by preference, of glass, to admit light to the bell, and in each of these partitions there is a valve for the passage of a man. When a diver wishes to enter the bell from the surface of the water, he opens the top valve, and enters the tube, then closes the valve, and descends the tube by a ladder until he comes to the other valve, which he then opens, and enters the bell.

Keiller, W. *Improvements in apparatus for cutting, reducing, or dividing vegetable, animal, and other substances.* Dated Apr. 27, 1858. (No. 936.)

This relates to certain arrangements of steel rollers, one above the other, the projections of one being opposite the grooves of the other. Two comb-like clearers, one for the upper roller and one for the lower, are fixed across the apparatus. The severed material is carried away by a pair of plain rollers.

Newton, W. E. *Improvements in machinery for splitting leather or skins.* (A communication.) Dated Apr. 27, 1858. (No. 937.)

This cannot be described without engravings.

Hughes, D. E. *Improvements in the means of, and apparatus for, transmitting signals and electric currents.* Dated Apr. 27, 1858. (No. 938.)

This is the American printing telegraph apparatus, and cannot be described in detail without reference to the drawings, and relates, 1st. Partly to a former patent of J. C. G. Kennedy, dated 20th Sept., 1855. The patentee now proposes to use as a circuit breaker a rotating arm, caused to travel (by clockwork) continuously over a ring of pins connected severally to their respective finger keys, which answer to the letters of the alphabet or other signs. Instead of depending on the transmitted currents for ensuring the synchronous action of the clockwork of the two communicating instruments, he provides a mechanical arrangement that will enable the operator at one end of the line to adjust the instrument at the opposite end, and when so adjusted keep its type wheel in a position corresponding exactly with the type wheel of the transmitting instrument. It relates, 2nd. To certain means of transmitting electric currents to distant stations, the chief object being to expedite the transmission of a succession of electric currents over one line wire.

Mennons, M. A. F. *An improved process for combining silk with other textile substances.* (A communication.) Dated Apr. 28, 1858. (No. 942.)

This relates to the preparation of a thread answering the purpose of silk thread, and it consists, 1. In covering a thread of cotton (or other material) with silk direct from the cocoons, and by a single operation. 2. In the arrangement of apparatus employed therefor.

Martin, B., and C. J. Light. *Improvements in railway turn-tables.* Dated Apr. 28, 1858. (No. 943.)

This consists, 1. In combining a solid or dead bearing for railway turn-tables when not in action, with the use of rollers when required for turning. The table is raised off its dead bearings by counterbalance weights or otherwise, and lowered on to the rollers by pillow blocks. 2. In keeping the table just free from its bearings by means of counterbalance weights or otherwise, so arranged as to support the weight of the table and turning load, but to allow it to be brought down to a dead bearing by the weight of a passing engine.

Tomlinson, E. *Improvements in cop tubes, and in the machinery or apparatus to manufacture the same.* Dated Apr. 28, 1858. (No. 944.)

This consists in employing certain shapes of material so that cop tubes of any desired taper may be made from sheets of paper or woven fabrics, and also from shavings of wood, leather, or similar materials. These are cut to a long acute taper

towards one end, and an obtuse taper towards the other. Upon a spindle or maundril the material is coiled, pressed, and pasted by an endless band passing over rollers. When entirely coiled on the spindle, and the cop tube formed, it is instantaneously thrown off the spindle, and another tube commenced.

Clark, W. *Improvements in railway crossings.* (A communication.) Dated Apr. 28, 1858. (No. 946.)

The patentee claims the construction of railway crossings, 1. By two moveable rails fixed the one to the other, and jointed to heel chairs, those two rails replacing the fixed rail and the switch of ordinary crossings. 2. By a bar of iron raised above the moveable rails, and connected at the two extremities to two ends of the ordinary fixed rail, this bar of iron allowing one of the rails to lodge under this counter rail. 3. By chairs which sustain the fixed parts of the apparatus, and serve to guide the moveable parts. 4. By rods or stretchers connecting rigidly the two switch or change rails. 5. By a manœuvring rod. He further claims a modified arrangement represented by a triple crossing described.

Newton, A. V. *Certain improvements in the construction of paddle-wheels.* (A communication.) Dated Apr. 28, 1858. (No. 947.)

This relates to the mounting of paddle-wheels within frames made adjustable, so that the angle at which the paddles strike the water may be varied at pleasure; and, further, to the moving of the paddles in and out of the drum in which they are contained by means of an adjustable excentric.

Winkler, A. *Improvements in printing or producing impressions in gold, silver, and oil colours upon metallic plates, and in the mechanism employed therein.* Dated Apr. 28. 1858. (No. 949.)

On a lithographic stone is made a delineation with pen or pencil, and from this a copy is printed. The colour or ink used to print with is amalgamated with a strong oil varnish upon the grinding stone. The stone is next wiped over, and the writing cleaned with a wet sponge. Then take a paper which is not "sized," and cover it with a paste of gum and starch flour. The paper is dried a few hours, cut to the size of the metallic plates to be printed, and afterwards to be put upon the stone, and passed through the common press. This done, the printing follows. The printing paper is laid between sheets of wet paper, and printed by a peculiar press, exhibited in the patentee's drawing. After taking away the paper the printing is to be laid with gold or silver, and afterwards varnished.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

Lane, J. J. *An improved arrangement of punches and dies in eyelet machines.* Dated Apr. 21, 1858. (No. 878.)

This invention was described and illustrated at page 465, No. 1814.

Hutchison, T. *Improvements in shawls.* Dated Apr. 22, 1858. (No. 881.)

This consists in reversing the position of the two materials or designs which form the turn-over corner with regard to the position of the materials or designs forming the body part of the shawl, so that the shawl, when fully opened out, will show on either side one corner of a different material or design to the rest of the garment; and while two of the opposite corners are square the other two are round.

Harrington, T. *An improved method of ventilating the hold and other parts of ships.* Dated Apr. 22, 1858. (No. 891.)

This consists in ventilating ships by pipes leading into a funnel or chimney, or into a shaft fixed in the deck. By branch pipes he causes the main pipes to communicate with the cabins. In some cases he increases the draft in the shafts or funnels by a steam jet.

Stocks, J., and C. Kaye. *Improvements in apparatuses for coupling and uncoupling wagons and carriages on railways.* Dated Apr. 22, 1858. (No. 893.)

This consists in the use of a jointed link made to fall and engage in the draw hook of the wagon, &c., to be coupled and made to rise to free itself from the draw hook by a transverse cranked bar or shaft extending across the wagon, &c., and terminating at each end in a handle or weight. The hook is held up, to be out of the way in loading, by weighted or spring catches. The back part of the link is connected to the crank of the tranverse bar by a stirrup, and the bearings in which the transverse bar is supported are slotted or lengthened out to allow play in the bar. Springs are fitted at the joints of the link to prevent the upper part thereof from falling back.

Ryder, W. *Improvements in preparing moulds and moulding boxes for casting metal or other materials.* Dated Apr. 23, 1858. (No. 896.)

The inventor makes use of two patterns, or two sets of patterns, one portion of each set being sunk in a bed of sand, &c. The patterns being thus prepared, transfers are taken which are used as moulds or beds to contain the patterns. A moulding-box is placed over each transfer, and sand is rammed into the moulding-boxes; the boxes are then removed and united together, the one forming the bottom box, and the other the top. By this means a mould is prepared, into which the metal or material is run. Instead of fixing the pins to a flange cast to the upper moulding-box, and making the sockets in flanges cast to the lower box, he casts the pin to a flange which is bolted to the upper moulding-box, and makes the socket in another flange which is bolted to the lower box. By this means the pin and the socket can be easily adjusted to each other, and repairs are facilitated.

Luis, J. *A moderator piston.* (A communication.) Dated Apr. 24, 1858. (No. 906.)

This apparatus is intended to regulate the heat caused by the steam in the spinning basins of the cocoons of the silk worm. It is composed, 1. Of a tube in which the steam circulates; 2. Of a double-cased cylinder; 3. Of a piston with its rod surmounted by a small pulley; 4. Of a guide for the rod of the piston; 5. Of a beam; 6. Of its support; 7. Of a counter weight; 8. Of a connecting rod; 9. Of a valve and its crank.

Lawson, J. *Improvements in machinery used in spinning flax and other fibrous substances.* (Partly a communication.) Dated Apr. 24, 1858. (No. 911.)

These are applicable to hot-water spinning frames, and consist in carrying the saddle with the pressing rollers by a pendant arm or arms, in place of employing the stands or supports projecting from the beam.

Newton, L. *Improvements in cop tubes used in spinning machinery.* Dated Apr. 26, 1858. (No. 912.)

The inventor makes the cop tube parallel from end to end, so that it will fit the spindle either end up, and tapers each end towards the spindle to avoid any jerk or sudden check in winding on the yarn. He makes the tubes of any material capable of being turned to the form of a tube, and of standing steam or heat.

Burleigh, B., and F. L. Danchell. *Improvements in filters.* Dated Apr. 26, 1858. (No. 913.)

The inventors construct a filter of an external casing made of metal, porcelain, glass, earthenware, &c., combined with an internal filtering medium in a solid form, composed of charcoal, stone, &c. Another part of the invention consists in adopting solid charcoal filtering blocks for cisterns, basins, or household filters, by fixing them to a pipe by which the fluid is drawn off after passing through the filtering blocks, which are likewise fastened with a water-tight cement or packing. Methods of adapting the same principle to other purposes are included.

MARTIN, W. A. *An improved shoe scraper.* Dated Apr. 26, 1858. (No. 918.)

This consists of a scraping wheel revolving on an axis.

DOBSON, T. *Improvements in machinery or apparatus for forging iron.* Dated Apr. 26, 1858. (No. 923.)

Between two upright frames or cheeks, a hammer-helve vibrates on a centre in the rear of the frames. Two horizontal slots in the frame allow of side-blocks working in them for carrying the ends of a transverse shaft, on which is fixed a pulley, fly-wheel, and double cam, for raising the hammer. The shaft is moved by screw or lever and quadrant, connected to the side-blocks by links, in order to bring the cam-shaft nearer to, or further from, the fulcrum of the helve so as to regulate the fall of the hammer, and, consequently, the force of blow to be given.

NEWTON, W. E. *Improvements in covering roofs and other parts of buildings with slate or other materials.* (A communication.) Dated Apr. 26, 1858. (No. 924.)

Here square blocks are used with their diagonal lines perpendicular to the eaves, or case line of the roof. A second point in the invention consists in clipping, or cutting away, the corners of the blocks opposite to the diagonal lines and parallel therewith, so as to admit of the slates forming butt-joints at their corners, these joints being covered over by the next course of slates.

SIMONS, E. *Improvements in cornices and cornice-poles for window and other curtains.* Dated Apr. 27, 1858. (No. 927.)

This consists in constructing cornices and cornice-poles with pulleys, cords, &c., so that the opening and closing of curtains suspended from them may be effected by pulling a string.

TOVELL, G. R. *Improvements in the construction of ships and other vessels.* Dated Apr. 27, 1858. (No. 931.)

A vessel is divided into two portions horizontally, the upper being provided with a flat bottom; the rudder also separates into two. When divided, the upper portion forms a flat-bottomed vessel, and the under portion a separate vessel. The two parts are attached by capstans.

DRUKKER, B. *Improvements in making shirts.* Dated Apr. 27, 1858. (No. 932.)

Instead of braces, supporters are added to the shirt with loops, or button-holes, which, being adjusted to the buttons of the trowsers, will cause the front of the shirt to fit the chest.

MOSS, M. *Improvements in ladies' petticoats.* Dated Apr. 27, 1858. (No. 933.)

The peculiarity here consists in the arrangement of the two lower hoops, the upper hoop being smaller than the lower one, and at a distance therefrom. The two last-mentioned hoops are connected by transverse diagonal pieces.

HULETT, J. *An improvement in shirt collars.* Dated Apr. 27, 1858. (No. 934.)

This applies to "turn-down," "Byron," or "Belgian" collars, and the object is to enable a short tie to be attached to the front of the collar without being passed round the neck. The invention consists in attaching to the band of the collar a tab, which is to be fastened by a button to the opposite side of the forepart of the collar after being placed on the neck. The tie or scarf is passed over this tab, and a bow or knot formed.

CHARPENTIER, J. F. M. *A fire escape.* Dated Apr. 27, 1858. (No. 939.)

The inventor employs a wicker basket fixed to a flat board. To the board are affixed iron loops, through which are passed two strong ropes, two ends of which are fixed by eyes to a small beam that is itself fixed inside the room, across the window, into the wall of the house. The basket is to run down the two ropes, the other ends of which are held by persons in the street below.

MENNONS, M. A. F. *An improved apparatus for the condensation of smoke.* (A communication.) Dated Apr. 28, 1858. (No. 940.)

Here the smoke is forced to pass through water, which takes up the carbonaceous particles, while the insoluble gases, being disengaged, are carried off to the furnace, where they are finally consumed.

MENNONS, M. A. F. *An improved saponaceous compound.* (A communication.) Dated Apr. 28, 1858. (No. 941.)

This compound consists of ordinary soap 4 parts, sand or pumice stone 3. These are boiled together for one hour, when the resulting compound is moulded off. The gelatinous matter which drains from the moulds is collected, and, being mixed with one part of ordinary soap and one part of beeswax, is again boiled and moulded.

VASSEROT, C. F. *An improved waterproof fabric.* (A communication.) Dated Apr. 28, 1858. (No. 945.)

This consists of a sheet of paper placed between two pieces of cloth, and glued thereto with glue dissolved in boiled linseed oil and lime collodion.

TAPIE, L. *Improvements in ship-building.* Dated Apr. 28, 1858. (No. 948.)

Timbers of ships are here entirely dispensed with, the hull being formed of a longitudinal planking and an exterior one crossing the first at an angle of about 45 deg. The space between them is filled up with felt. The ends of the plankings are inserted in grooves in the keel, stem, and stern post, the keel being further steadied by two carlings to which the moulds are bolted. Strong iron hoops are fixed over the inner planking instead of the ordinary timbers.

COMPLETE SPECIFICATIONS RECENTLY FILED.

FOSTER, E. *A new and useful or improved life-preserving berth for navigable vessels.* Dated Apr. 7, 1858. (No. 749.)

This consists in a moveable and adjustable berth, having flaps or keels and folding inflatable air chambers, whereby the same may be used as a life preserver in vessels.

MASON, S. O. *Certain new and useful improvements in door-hinges.* (A communication.) Dated Apr. 8, 1858. (No. 752.)

This consists in so constructing the journals and bearings of the two leaves of a hinge, with locking recesses and holding projections, as to enable the two leaves to be connected or disconnected in a lateral direction, and to operate together.

RICHMOND, E. *Certain new and useful mechanism for reducing, or reducing and crushing, and in various other respects treating grain, sugar cane, tobacco, or other substance or substances.* (Partly a communication.) Dated Apr. 8, 1858. (No. 753.)

This consists of certain combinations of discs arranged side by side on parallel neighbouring shafts, with clearers, &c.; also of certain rotary cutters, endless aprons, bolting or sifting mechanism, &c.

MENNONS, M. A. F. *A certain medicinal compound for the treatment of epilepsy.* (A communication.) Dated Apr. 17, 1858. (No. 841.)

This consists of cinnabar, mistletoe, castoreum, succinum, essence of marjoram, Peruvian balsam, and syrup of piony. The solid ingredients are finely triturated, and the whole mass made into pills.

MENNONS, M. A. F. *An improved system of portable tents for military and other purposes.* (A communication.) Dated Apr. 17, 1858. (No. 842.)

This consists in the construction of tents for campaigning, &c., based on the combination of detached pieces in triangles, which, when required, may form a cloak for the bearer, and thus, by equal and useful distribution of weight, reduce to its minimum the fatigue of transport.

MENNONS, M. A. F. *An improved substitute for the pulverized cotton and wool employed in the*

manufacture of felted tissues, papers, and other fabrics. (A communication.) Dated Apr. 17, 1858. (No. 813.)

The applicant employs the fibrous matters obtained from the filamentous plants in general, but preferably from the "aloes," "phormium tenax," "manilla hemp," and the "agava." These products being thoroughly dried, he reduces them to an impalpable powder. The dyeing of the pulverised matter to the required tint completes the operation.

GILMOUR, G. *A new and useful or improved messenger shackle block.* Dated Apr. 22, 1858. (No. 886.)

The inventor claims a messenger shackle block or combination of sheaves, a forked pawl, a roller, and chain space or passage. Also, hinging certain parts and a pawl to the remainder of the frame, that the roller and pawl may be turned toward the sheaves of the pulley. Also, combining with the pawl and the pulley frame a mechanism by which, by pressure of the chain against the pawl, such pawl may be caused to lift the parts before named and the roller, to facilitate the movement of the shackle block on the chain. The invention cannot be described without engravings.

EMERY, A. F. *A new and useful or improved machine for sewing cloth or other material.* (A communication.) Dated Apr. 28, 1858. (No. 919.)

The object here is to prevent the thread from being unravelled, and the patentee accomplishes this by introducing into each loop of the chain stitch sewing an unlooped thread, which he terms a binding thread, it being drawn up against the cloth by the loops of the chain stitch sewing.

BENNETT, J. H. *An improved arrangement of safety valves for steam, gas, or any aeriform or liquid body.* Dated Apr. 27, 1858. (No. 930.)

This invention cannot be described without engravings.

JOHNSON, J. H. *Improvements in railway wheels, and in axle-boxes and bearings for the same.* (A communication.) Dated June 4, 1858. (No. 1264.)

These consist, 1. In so constructing and arranging the wheels with their axles and bearings that each wheel is on a separate and independent axle, has a single bearing, and is self-balancing. 2. In an improved construction of axle boxes in which the ends of each separate axle revolve, whilst they are free to describe the necessary arc of a circle to enable them to adjust themselves individually to the radius of the curves of the rails along which the carriages are passing.

BIGELOW, L. A. *Improvements in sewing machines.* (A communication.) Dated June 11, 1858. (No. 1326.)

These consist, 1. In so constructing a sewing machine that it shall be applicable to sewing with a single and with a double thread. 2. In improved mechanism for taking, spreading, tightening, and interlacing the loops, whereby the several operations are effected with greater accuracy and speed, and less liability of the mechanism getting out of order. This invention cannot be described without engravings.

BOUSFIELD, G. T. *Improvements in marine steam engines.* (A communication.) Dated June 11, 1858. (No. 1333.)

This consists in combining with an ordinary air pump a pipe leading from a point therein, and prolonged to some point near the bottom of the vessel, such pipe having a proper valve or valves. The invention cannot be completely described without engravings.

GUFFROY, C. C. J. *A new smoke-consuming apparatus, and also a new method of introducing the coal or fuel into it.* Dated June 15, 1858. (No. 1348.)

This stove is composed of thin bars placed transversely on longitudinal beams, each bar being subjected lengthways to the inequalities presented by the stove, so that the patentee obtains thus lengthways all the cavities and projections necessary. This method of construction enables him to obtain transverse air-holes through which jets of air, coming from right and left, seize the gases at the moment of their formation in the layer of coke where they are to be consumed.

ATWATER, B. *An improved sewing machine.* Dated June 16, 1858. (No. 1360.)

These consist, 1. In such an arrangement of guide plates with respect to the bed plates and the needle, or the path of the latter, that a loop of the thread of the needle may be formed between the plates or aside of one of them, and subsequently, by the feeding movement of the cloth, be carried against the rest or the top of one of the plates so as to cause the bow of the loop to spring upward into a proper position for the loop to receive the needle during its succeeding descent. 2. In an arrangement of the guide plates with respect to one another, the needle, and the bed plate, so that there may be a space between the bed plate and the upper end or notch of the recessed guide plate, and the two guide plates be placed in such close proximity to one another as to hold the middle of the bow of the loop in position and bridged across the recess of that one termed the recessed guide plate in a manner to enable the needle to pass into the loop on the next descent of the needle. 3. In a mode of, or mechanism for, impelling the feeding foot. 4. In an adjustable spool holder. These several parts cannot be described without engravings.

CAHOON, C. W. *An improved machine for sowing seed or fertilizing material or other substances broadcast.* Dated June 24, 1858. (No. 1431.)

This consists of a rotary hollow circular chamber revolving on a horizontal axis, and throwing the seed, &c., by the centrifugal force imparted to it by the rapid revolution of the chamber from the outer edge of the same, in a plane vertical, or nearly vertical, to the ground; also, a funnel-shaped rotary discharging chamber operating as above stated, and having either helical flanges or straight plates inserted therein to control the flow of the grain, &c.; also, a combination of either of the above forms of discharging chamber, with a disc or shield placed before the eduction mouth of the discharger for preventing the flow of the air into the same; also, a combination of either of the above forms of discharging chamber, with or without such disc or shield, with a hopper containing either a seed agitator, or a means of regulating the flow of seed out of the eduction opening from the hopper into the discharger, or both.

LEMON, T. *Improving Cartwright's original patent chain harrow.* Dated June 26, 1858. (No. 1440.)

This invention cannot be described without engravings.

NORTHEN, W. *The application of stoneware or earthenware, coloured or plain, to improved and original designs.* Dated July 12, 1858. (No. 1558.)

This consists in an improved description of stoneware pipes used for drains, in an improved method of constructing and examining sewers, culverts, &c., manufactured from stoneware; in making closed cylindrical or square stoneware vessels with suitable bungs; in constructing stoneware jars, &c., so that when the cover or lid is on by a turn it is fastened to the jar, and the contents hermetically sealed; in an improved description of stoneware mangers and troughs for stables, and in the application of colours to the exterior of jars, bottles, &c.

MENNONS, M. A. F. *Improvements in the construction of fire engines and similar apparatus.* (A communication.) Dated July 12, 1858. (No. 1562.)

This invention cannot be described without engravings.

PETRZIWALSKY, J. V. N. S. *Improvements in the manufacture of bread, and in apparatus to be employed therein.* Dated July 20, 1858. (No. 1641.)

This refers to a method of making all descrip-

tions of fancy bread, and consists in imparting to the compound, when in a moistened state, a tearing action. The apparatus to be used consists of a new form of oven, by which greater uniformity of heat is obtained.

SHANTY, M. *A mercurial level, to show the height of liquids in enclosed and opaque vessels, vases, and principally for steam boilers.* (A communication.) Dated July 24, 1858. (No. 1667.)

This invention cannot be described without engravings.

SHANTY, M. *A metallic trimming for intercepting water, air, gas, or steam round piston rods, of whatsoever they may be; the same may be applied to the joints of steam machines.* (A communication.) Dated July 24, 1858. (No. 1669.)

The trimming of each rod is composed of many series of five or six washers, each of which is composed of four or five plates of lead, and others formed of 1 part of bismuth, 10 of lead, 2 of pewter. The washers are pierced in the centre, and, in order to be placed without undoing the rods, are cut from the centre to the circumference in a straight line. The patentee begins by placing one or two lead plates, and then a plate of the composition, then five or six plates in lead, one of composition, and so on. As fast as the plates are placed they are fixed solidly by the hemp or tow press, after which they are enveloped with hemp dipped in oil, upon which the tow or hemp press is let down to the point where it is to remain. During the first half-hour motion of the machine the washers are gently and progressively made tighter until there is no more escape of water, steam, or gas, and progressing gently are made faster every time the washer has used the trimming. When it cannot be made tighter on account of the use of it, a composition washer is added to it. The grease preferred is composed as follows:—Hog's grease 100, lead and silver ore 5, soap 100, water 100.

HURN, G. *Improving the manufacture of certain articles made from fibrous materials.* Dated July 28, 1858. (No. 1696.)

This has reference to a method of finishing and securing the cut or ragged edges of articles manufactured from matting composed of vegetable or other fibre, such as cocoa-nut, manilla, Spanish hair, aloe, jute, or cotton, and consists in substituting, in place of the ordinary linen or leather binding, a rim or edging formed of strands of material from which the articles are made.

MENNONS, M. A. F. *Improvements in the construction of Jacquard looms.* (A communication.) Dated Aug. 14, 1858. (No. 1856.)

This consists in a construction of Jacquard looms specially applicable to carpet manufacturers, and in certain cases to the production of shawl and "broché" tissues. It cannot be described without engravings.

PINTA, A. V. *Improvements in blank forms of cheques or drafts on bankers, payable on demand, relating to the crossing of such cheques or drafts.* Dated Aug. 18, 1858. (No. 1880.)

This consists in putting on the blank form of a cheque or draft the following instruction: "If you cross this cheque, cut or tear off this at the same time," or, "If you cross this cheque without a banker's name, cut or tear off this," or, "If you cross this cheque with a banker's name, cut or tear off this," or words "at the same time" might be added, and the second part might end by "all this." Indicating only that such cheque or draft has been crossed in some way may be effected by encompassing or indicating by lines, points, or other marks some special part of the blank form of such cheque or draft.

MENNONS, M. A. F. *Improvements in the supports of rails for railways.* (A communication.) Dated Aug. 31, 1858. (No. 1971.)

This consists in an arrangement of metallic rail supports, the main feature of which is the obviation of direct contact in their separate parts by the interposition of semi-elastic matters, the result of which is an increase of solidity, and a reduction of the wear and tear arising from the direct action of the unprotected metallic surfaces.

JOHNSON, J. H. *Improvements in the prevention of steam-boiler explosions.* (A communication.) Dated Aug. 31, 1858. (No. 1977.)

This relates to preventing steam boiler explosions arising from scarcity of water in the boiler and an undue heating of the plates, and consists in placing within the boiler a metallic electric conductor insulated from the boiler plates, and made to communicate with the exterior of the boiler, whereby an electrical equilibrium is maintained between the inside of the boiler and the outside thereof.

PROVISIONAL PROTECTIONS.

Dated November 1, 1858.

2428. F. Wrigley, of Manchester, consulting engineer. An improved self-acting safety coupling for railway and other purposes.

Dated November 10, 1858.

2518. J. Corner, of City-road, boot maker. Improvements in machinery for making metallic screw rivets, and for uniting with them parts of boots, shoes, portmanteaus, leather hose, buckets, harness, and other leathern articles.

Dated November 16, 1858.

2572. A. I. H. Parent, of Paris, manufacturer. An improved manufacture of buttons, and the apparatus employed therein.

Dated November 17, 1858.

2586. E. Welch, of St. John's-sq., Clerkenwell, tobacco maker. Improvements in the manufacture of tobacco, and in apparatus therefor.

Dated November 20, 1858.

2638. W. Lea, of Wolverhampton, brass founder and cock maker. A method of lubricating cocks and taps.

Dated November 26, 1858.

2684. J. Harrison, of Blackburn, machine maker. Improvements in rollers applicable to sizing, dressing, calendering, and squeezing machines.

2686. A. Bowie, of Glasgow, engineer. Improvements in governors for marine engines.

2688. M. A. F. Mennons, of Paris. An improved manufacture of leather. A communication.

2690. T. B. Hubbell and G. J. Rollason, of Castle-st., manufacturers. Improved apparatuses for brightening and polishing metal surfaces.

2692. W. Richards, of Harpur-st., Red Lion-sq., engineer. Improvements in the construction of gas meters.

Dated November 27, 1858.

2694. J. Spratt, of College-st., Camden-town. Improvements in the manufacture and strengthening of paper.

2698. R. Alexander, of Dillichip, Dumbarton, bleacher. Improvements in treating, preparing, and bleaching textile fabrics and other materials.

2700. H. L. Pattinson, of Jesmond, Newcastle-on-Tyne. Improvements in utilizing the heat of slags of iron and other works.

2702. G. B. Sander, of High Holborn. Improvements in jugs.

2704. S. Diggle, of Radcliffe, machine maker. Improvements in pattern chains, or other such apparatus used in weaving.

Dated November 29, 1858.

2706. L. A. Possoz, of Paris, chemist. Manufacturing alkalies, and obtaining simultaneously other chemical products.

2710. G. Collier and W. Noble, of Halifax, York. Improvements in means or apparatus for the manufacture of spokes for carriage wheels, which improvements are also applicable to the cutting of wood for other purposes.

2712. G. Hadfield, of Carlisle, varnish maker. Improvements in the construction of carboys, barrels, and other vessels of capacity.

2714. C. Hancock, of West-st., Smithfield, gutta percha manufacturer. Certain improvements in the insulation and manufacture of electric telegraph wires and cables.

2716. W. A. Henry, of Sheffield, engineer. Improvements in machinery or apparatus for attaching the soles and heels of boots and shoes to the upper leathers, and in the fastenings employed for that purpose.

2718. J. B. Blanjot, of Paris, merchant. Improved petticoats for ladies.

2720. C. Bedells, of Leicester. Improvements in the manufacture of elastic fabrics, and in the machinery employed in this manufacture.

2722. G. J. Bensen, of St. George's-in-the-East. Improvements in cleansing or purifying animal charcoal after it has been employed by sugar refiners.

Dated November 30, 1858.

2726. A. A. Burton, of Wych-st., machinist. A movable face and handle for smoothing irons.

2728. D. Thomson, of Old Brompton. Improvements in machinery for raising water and other liquids.

2730. A. E. C. Scheidel, of Frankfort-on-the-Main, manufacturer. Improvements in fastenings for belts, braces, garters, books, porte-monnaies, portfolios, pocket-books, invoice, writing, and cigar-cases, reticules, bags, and other similar articles or purposes. A communication from P. F. Gouda.

2732. W. E. Newton, of Chancery-lane. Improvements in telegraphing, and in telegraphic apparatus. A communication.

2734. J. Coulson, of Newark, engineer. Improvements in threshing and dressing machines.

Dated December 1, 1858.

2736. R. H. Bow, of Edinburgh, civil engineer. Improvements in railway chairs and fastenings.

2738. E. Jones, of Dudley, manager. An improvement or improvements in the manufacture of coke in ovens.

2742. J. Samuel, of Great George-st., Westminster, civil engineer, and J. Nicholson, of Bromley, engineer. Improvements in, and in connection with, marine and other steam engines.

2744. H. Adcock, of City-road. Improvements in furnaces and apparatus for annealing wire.

2746. G. W. Bales, of Ipswich, gun-maker. Improvements in apparatus for retaining doors, sashes, or frames, when shut or closed.

2748. S. Newington, of Ticehurst. Improvements in agricultural implements.

2750. F Fincham, of Ravenhead, Lancaster, esq. Improvements in the construction of annealing kilns or ovens.

2752. J. Lewis, of Elizabeth, New Jersey. Improvement in means for attaching sails to the yards of ships or vessels.

Dated December 2, 1858.

2754. L. MacKirdy, of Greenock, sugar refiner. Improved combined bathing, washing, and water-closet apparatus.

2755. L. MacKirdy, of Greenock, sugar refiner. Improvements in the manufacture of sugar.

2756. J. Rogers, of Queen-sq., City, rope maker. Improvements in the manufacture of ropes, cables, cords, and lines.

2757. W. Robertson and J. G. Orchar, of Dundee, engineers. Improvements in machinery or apparatus for winding yarns or thread.

2758. J. Tyssen, of Rotterdam, mariner. Improvements in obtaining and applying motive power.

2759. J. Baillie, of Vienna, engineer. Improvements in the construction of railway wheels.

2760. G. Spiller, of Upper Southwicke-st., lieut.-colonel. Improvements in knapsacks for military and other purposes.

Dated December 3, 1858.

2761. M. Henry, of Fleet-st. Improvements in manufacturing and revivifying bone black or animal charcoal, and in kilns and apparatus employed therein. A communication from J. A. Lagard.

2763. M. Tooke, of Norwich, tailor. Improvements in apparatus for measuring the human figure, and applying the same for tracing out garments for the human figure.

2765. S. Peters, of St. Denis, near Paris, mechanic. Improvements in the manufacture of pipes and tubes, and in the apparatus employed therein.

2767. C. Coates, of Sunnyside, Lancaster, engineer. Improvements in maundrills for printing.

2769. C. F. Vasserot, of Essex-st., Strand. Improved arrangements to be applied to window-sashes to prevent draughts and the infiltration of water. A communication from E. Desrocques, of Havre.

Dated December 4, 1858.

2771. J. Cameron, of Glasgow, engineer. Improvements in apparatus for the manufacture of sugar.

2773. L. W. Fletcher, of Bleaklow, near Bury, spinner. Improvements in the construction of electric telegraph cables.

2775. R. Pickering, of Lockerbie, Dumfries, railway inspector. Improvements in communicating signals from one part of a railway train to another.

2777. T. Sibley, of Ashton-under-Lyne, machine maker. Improvements in looms for weaving.

2779. J. B. A. Monnier, of Nemours, France. Improvements in actuating railway brakes.

2781. H. T. Yates, of Nottingham. Improvements in the manufacture of boards or sheets, when wood sawdust is used.

2783. M. Henry, of Fleet-st. Improvements in weaving and in looms or apparatus employed therein. A communication.

2785. J. Platt, of Oldham, mechanical engineer. Improvements in mules for spinning.

Dated December 6, 1858.

2787. J. Jobson, of Derby. Improvements in the manufacture of stoves and fire-places.

2789. B. Nicoll, of Regent-st., shirt maker. Improvements in agricultural machinery for all kinds of crop, chaff, turnip, and other root-cutting, and for the purposes of haymaking, and rubbing corn and seed from the stalks (instead of threshing).

2791. G. Snell, of Leeds, cloth finisher. Improvements in machinery or apparatus for cutting woollen fabrics.

2793. D. B. White, of Newcastle-on-Tyne, doctor of medicine. Improvements in indicating gauges.

2795. F. W. Fletcher, of Hurdington, near Birmingham, tube maker. Improvements in bolts for securing doors, and for other similar purposes.

Dated December 7, 1858.

2797. J. E. Boyd, of Lewisham, gentleman. Improvements in the construction of taps, valves, cocks, spiggotts, or other apparatus or instruments for gauging or for drawing off the liquid or fluid contents of any, cask, butt, vat, barrel or other vessel.

2799. C. Williams and W. Ellison, of Kingsland-road. A new mode or method of securing and liberating the corks and stoppers of bottles.

2801. W. Madders and J. Waddington, of Manchester, embroiderers. Improvements in machinery or apparatus for embroidering woven fabrics.

2803. J. G. E. Larned, of Brooklyn, U. S. A. Improvements in the construction and arrangement of the boilers and working parts of steam fire engines, part of which is applicable to engines for other purposes.

2805. J. Haslam, of Preston, bookkeeper, and J. Lutener, of the same place, shuttlemaker. Improvements in healds used in looms and dressing frames.

2807. S. W. Pugh, of New Peckham. Improvements in obtaining and purifying naphtha, paraffine, and other oils, and also spirits.